

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**CENTRAL METALLURGICAL RESEARCH AND DEVELOPMENT INSTITUTE  
STATE MINISTRY OF SCIENTIFIC RESEARCH THE ARAB REPUBLIC OF  
EGYPT**

**EX-POST EVALUATION STUDY ON  
UPGRADING OF METAL PROCESSING TECHNOLOGY PROJECT  
IN THE ARAB REPUBLIC OF EGYPT (2000-2004)**

**FINAL REPORT**

**31<sup>st</sup> January, 2008**

**El-Zanaty & Associates**

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## I. INTRODUCTION

Since 1991, Government of Egypt (GOE) had made efforts of economic reform, and achieved financial stability and high growth of GDP. But the supporting industries who should have an important role of supplying materials and parts were still suffering from lack of rather basic technologies and methodologies of quality management. That factor impeded enhancement of competitiveness of Egyptian industry.

In August 1998, GOE requested Government of Japan (GOJ) to carry out a project for strengthening technology of Central Metallurgical Research and Development Institute (CMRDI). CMRDI is a research center affiliated to the State Minister of Scientific Research. The mission of the institute is to enhance the competitiveness of the Egyptian industry and the welfare of the society through technological development and technology transfer to companies.

GOJ dispatched several study teams, and then Record of Discussions (R/D) was signed in April 2000 by Egyptian side and Japanese side to agree with the framework of “The Project on Upgrading of Metal Processing Technology in Arab Republic of Egypt” (hereinafter referred to as “the Project”). The Project started in October 2000 and ended in September 2004.

The Terminal Evaluation was implemented jointly by Egyptian side and Japanese side in September 2004, just before the termination of the Project’s period of cooperation. The evaluation report mentioned as conclusion that the Project had been successfully implemented regardless of many inhibiting factors in efficiency, on the other hand, among a number of the factors that had contributed to the success of the Project, the commitment of the highly motivated C/Ps and Japanese experts was of particular significance.

## II. GOALS AND OBJECTIVES

In the long run, the project overall goal is to upgrade the technical capability for production of metal processing industries in Egypt. To achieve this goal, Japan International Cooperation Agency (JICA) and CMRDI implemented the technical cooperation project to improve CMRDI’s capacity of metal processing technology.

### *Scope of evaluation study*

The ex-post evaluation study aims at the verification of the important issues relating to the project’s impact and sustainability observed after completion of the project. The ex-post evaluation seeks answers to the following main evaluation questions:

#### 1. Impact

- How far has the overall goal been achieved since the terminal evaluation?
- Are the unintended positive and negative effects observed?
- What factors contributed to positive and negative impacts?

#### 2. Sustainability

- How has the counterpart agency (CMRDI) been maintaining the project activities and services provided by the project?
- Have the project outcomes been maintained since the termination of assistance?
- What factors are contributing to or inhibiting the project effects for sustainability?

The study focuses on the technologies transferred through the Project. Five main areas

are concluded:

1. Control of mechanical properties and quality control
2. Casting
  - Aluminum high pressure die casting
  - Chemically bonded sand molding
    - Shell mold process
    - Cold box process
3. Heat treatment
  - Austempering of ductile cast iron
  - Surface hardening
4. Fatigue evaluation of welded joint (Not effected except for researches)
5. Laser cutting  
(See annexes 2, 3)

### III. PROJECT OVERVIEW

The project specifics are as follows:

#### **Overall Goal**

Technical capability for production of metal processing industries in Egypt is upgraded.

#### **Project Purpose**

Technical services for metal processing industries extended by CMRDI are upgraded.

#### **Outputs**

Project operation unit is enhanced

1. Necessary machinery and equipment are provided, installed, operated and maintained properly.
2. Technical capability of the counterpart personnel (hereunder referred to as C/P) is upgraded.
3. Technical services for metal processing industries are provided.

#### **Activities**

1. Allocate necessary personnel.
  - 1-1 Make facility refurbishment plan and implement as planned.
  - 1-2 Provide and install necessary machinery and equipment.
  - 1-3 Operate and maintain machinery and equipment properly.
2. Formulate plans of activities.
  - 2-1 Make Technical Cooperation Program.
  - 2-2 Implement technology transfer to the C/P.
  - 2-3 Monitor and evaluate the result of the technology transfer to the C/P.
3. Make budget plan and execute properly.
  - 3-1 Make plan of technical services.
  - 3-2 Implement technical services.
  - 3-3 Monitor and evaluate technical services.
4. Establish and operate management system.

### **Actual situation**

- a. 6 long-term and 47 short-term experts have been dispatched and implemented technology transfer as planned
- b. 11 C/Ps had training in Japan as planned.
- c. All the machines and equipment have been provided to the project in a timely manner as planned, these were:
  - Heat treatment facilities
  - Formaster
  - Fatigue Testing Machines
  - High Pressure Die Casting Machine,
  - Cold Box Molding Machine
  - Laser Machine.

## **IV. EVALUATION METHODS USED**

The study comprises the following

### **1. Qualitative study:**

The qualitative study contained both in-depth interviews (IDIs) with the key-personnel and focus group discussions (FGD) with groups representing different stakeholders using surveys and questionnaires.

#### **In-depth Interviews:**

In-depth interviews were conducted with:

- The managers of CMRDI
- The counterparts and operators who worked with Japanese experts at CMRDI and also who were trained in Japan.
- The new staff that joined CMRDI after termination of the Project and in charge of the fields related to the Project.
- ESLIA members and EDCC members.

(ESLIA: Egyptian Society for Laser Industrial Applications, EDCC: Egyptian Die Casting Chapter)

#### **Focus Group Discussion (FGD):**

FGD was conducted with:

- A group of engineers who obtained training in the center but work outside CMRDI in the public and private sector (ESLIA members)
- A group of engineers who obtained training in the center but work outside CMRDI in the private sector (EDCC, SMEs).

#### **Other tools:**

Observation of machine and equipment operations (those provided during the project)

### **2. Quantitative study:**

The quantitative tool included the following

#### **Records (2000-2004)**

- Review the documents and reports of CMRDI related to its activities concerning the Project.

- Financial sustainability ( analysis of financial statements, sources of revenue, current costs, i.e. operating and maintenance costs)
- Educational resources (personnel, lecture halls, equipments, cases etc.)
- Information technology and communication system with other facilities (computers, library, technical and quality records and related databases and or analyses)
- Check list of all instruments supplied by the project and their conditions.

Records for the years 2005, 2006 and 2007 were revised to cover the period following the final evaluation study.

### Questionnaires:

Questionnaires were distributed to a group of beneficiaries from ESLIA but not collected

(See annex 3)

### 3. Evaluation Team:

Name	Role
Dr. Fatma El-Zanaty	<p><b><u>Team Leader</u></b></p> <ul style="list-style-type: none"> <li>• Review both the Arabic and English instruments</li> <li>• Share in preparing the draft and final report</li> </ul>
Dr. Sara El-Refaay Investigator, Zanaty & Associates	<p><b><u>Principle Investigator</u></b></p> <ul style="list-style-type: none"> <li>• Help in developing the in-depth guidelines.</li> <li>• Conduct some of the in-depth interviews</li> <li>• Conduct FGDs</li> <li>• Help in summarizing the IDIs results</li> <li>• Share in preparing the draft and final report</li> </ul>
Eng. Sherin El-Kordy	<p><b><u>Senior Researchers</u></b></p> <ul style="list-style-type: none"> <li>• Help in developing the in-depth guidelines.</li> <li>• Help in summarizing the IDIs results</li> <li>• Prepare the draft and final report</li> </ul>
Eng. Mohamed Abul Nur	<p><b><u>Data Analyst</u></b></p> <ul style="list-style-type: none"> <li>• Responsible for the data entry of the collected secondary data.</li> <li>• Conduct the analysis required for the study.</li> </ul>
Mr. Sameh Said	<p><b><u>Research Assistants</u></b></p> <ul style="list-style-type: none"> <li>• Share in preparing the report layout and presentation of the study.</li> </ul>

**4. Evaluation Plan (1/12/2007 to 1/2/2008)**

<b>Activity</b>	<b>Week 1</b>	<b>Week 2</b>	<b>Week 3</b>	<b>Week 4</b>	<b>Week 5</b>	<b>Week 6</b>	<b>Week 7</b>	<b>Week 8</b>
Preparing the evaluation grid								
Instruments development								
Conducting IDIs, and FGDs								
Collecting records and Questionnaires								
Data processing								
Data Analysis								
Draft report								
Final report								

Final report upon acceptance is on 28<sup>th</sup> February, 2008.

## V. RESULTS OF EVALUATION

The study is two folded; the first part is on the following functions and activities within CMRDI:

1. Heat Treatment
2. High pressure Die Casting
3. Laser Cutting
4. Material Evaluation
5. Cold Box and Shell Molding

And was focused on five performance areas:

- A. Efficiency and Post efforts
- B. Economic Impacts
- C. Development
- D. Equipment Availability and,
- E. Financial Analysis

The second part is through visits to Other parties (Companies from ESLIA, EDCC) in the industrial areas (El-Obour, 10th of Ramadan, Cairo University Laser Center) as well as Laser Center, Cairo University.

Detailed results are found in annexes 5 and 6.

### 1. CMRDI

#### a) Quantitative summary results are as follows:

<b>A) Efficiency and post efforts</b>	<b>Total Project</b>	<b>Remarks</b>
Number of companies that benefited from CMDRI (2002-2004)	37	
Number of newly benefited companies (2004-2007)	19	
Number of recorded researches in 2005	10	
Number of recorded researches in 2006	2	
Number of recorded researches in 2007		
Number of recorded services in 2005 (Projects, tests, evaluation,..)	15	
Number of recorded services in 2006 (Projects, tests, evaluation,..)	31	
Number of recorded services in 2007 (Projects, tests, evaluation,..)	55	
Number of unaccepted services in 2005	0	Services are reviewed and reworked and/or completed until client full satisfaction
Number of unaccepted services in 2006	0	
Number of unaccepted services in 2007	0	
Number of new contracts since 2004	11	
Percentage of executed contracts	84.00	
Percentage of ongoing contracts	26.67	
Percentage of crippled contracts	0	
Staying qualified workforce	9 of 11	Two left CMRDI



**B) Economic impacts**

Impacts on benefited companies as follows:		
Increase in sales volume or market share (collective or individual)		No accurate feedback
Increase production ( tones or number, new products)		On-going production of 250 chain pieces from cold box technology on a monthly basis
Increase in product price		No accurate feedback
Increase in export figures (collective or individual)		No accurate feedback
Decrease in imported materials (replacement by local products)		No accurate feedback
Decrease in rejects		No accurate feedback
Number of training programs (2004-2007)	35	
Percentage of satisfied attendees	100	169 attendees
Percentage of unsatisfied attendees	0	
Percentage increase in employment recorded by Eslia		No accurate feedback
Percentage increase in employment recorded by Edcc		No accurate feedback
Number of relevant privatized companies since 2004 Eslia	None	
Number of relevant privatized companies since 2004 Edcc	None	

**C) Development**

Number of newly adopted services/ tests since 2004	4	
Number of newly developed associations since 2004	None	
Impact of training on employment (percentage general) in public sector		No accurate feedback
Impact of training on employment (percentage general) in private sector		No accurate feedback

**D) Equipment Availability**

	Percentage	
Machine availability in 2005	82.23	Hrs available = Annual available working hrs - Annual Breakdown hrs Availability = Hrs available/ Annual available working hrs
Machine availability in 2006	79.67	
Machine availability in 2007	73.33	
Percentage of cost recovery	230 %	Income (2004-07) /price of equipment (the data is only provided from Die casting only)

**E) Financial analysis**

Adequacy of financial support ( percentage of covered costs)		
Government	30.00	
Service fees	70.00	
Grants		
Targeted budget for the coming 3 years (State Ministry of Scientific Research)		No plan provided
Percentage of available planned sources during this period		No accurate feedback

**b) Qualitative summary results are as follows:****A. Efficiency and Post efforts**

- One of the best applications is the ADI (Austempered Ductile Iron) especially on valuable components such as crankshafts and gears.
- Training courses need to increase especially in the Laser Cutting area.
- No complaints were received from the clients as the projects and services are completed, sometimes minor repairs and fixations are performed before the final acceptance of the client.

**B. Economic Impacts**

- Generally, there is no economic feedback collected from the clients or associations, e.g. change in employment figures, export, reduction of important material and components, ..etc
- Also no figures that reflect the real impact on production cost, efficiency, quality improvement, rejects reduction are available at CMRDI.

**C. Development**

- New techniques in welding ADI are introduced.
- Although capabilities in failure analysis are available, they are only directed to research works rather than services to companies.
- Fatigue testing is expensive which do not encourage companies to make use of, especially after treatment of critical components. This fact may cripple the continuation of this capability.
- CMRDI needs additional melting furnace for Copper Alloy.
- CMRDI needs employees in the area of material evaluation.

**D. Equipment Availability**

- Only one major breakdown of the Laser machine that extended to six months during the project period (2000-2004, fiber optics cable was not available). In February 2007 the machine chiller was down for two months
- Maintenance and Calibration plans for the project machines are in place and adequately performed.
- Generally, the activities are performed under normal safety measures with no accident recorded. Nevertheless, there is no emergency plan in place.
- The machine availability slightly decreases from 82% in 2005 to 73% in 2007 in Laser Cutting. This is based on the following:  
Hrs available= Annual available working hrs - Annual Breakdown hrs

Availability = Hrs available/ Annual available working hrs

- There is no breakdown analysis for the equipment.

### E. Financial Analysis

- Pilot projects on ADI are extended to companies with no direct gain to CMRDI
- There is no future plans and consequently no plan for future needs in the short term (3-5 years)
- In general, services provide adequate fees that cover production costs, maintenance, labor and salary for the relevant areas in CMRDI.
- In general, a consensus accord in the relevant functions is that there is no economic factors that might hinder the continuation and sustainability of the project.

## 2. Other stakeholders (ESLIA, EDCC companies, and other beneficiaries)

(See annex 7 for details)

### a) Quantitative summary results are as follows:

- Companies in the **Laser Cutting technology** achieved 40% cost cutting and increase in revenue from 3 LE/Hr to 10 LE / Hr as direct economic impact such as. **MOG Co.**
- Companies in **Die Casting technology and Heat Treatment** achieved reduction in rejects up to 25-40% such as **Three Brothers Co.**
- Production in **EMCO Co.** increased from 10,000 stamps to 100,000 stamps (1000%) in Die Casting Technology. The Company owns its Die Casting Machine and they produce stamps at CMRDI.
- Direct impacts include reduction in stamp production time by EMCO.
- Impact was higher in small enterprises such as the **Egyptian International Company for Metal Technology**; their major customers increases from 1 in 2003 to 6 in 2007, the products types increased from 3 stamps to 14 different stamps in 2007 (these are stamps by Die Casting Technology provided by CMRDI), the reject is only 1-2% which is normally reworked. In addition, their market share increased from 3.3% to almost 20% IN 2007 and the recruited employees increased from 6 to 20 technicians (333%)

### b) Qualitative summary results are as follows:

- Companies which own Laser Cutting equipment have more advantage than those who solicit services from CMRDI such as MOG Co.  
CMRDI as a know-how transferor and facilitator is effectively executing the service required. From the point of view of the beneficiaries, the existence of Laser Cutting Equipment propels the technology transfer out of training and piloting.
- Three Brothers benefits from solutions such as Silicone 12 as well as deformation problems from CMRDI. They need a technique to remove Magnesium from alloys.
- There is no effect on employment in Medium Enterprises such as Three Brothers Co. , MOG and EMCO.
- Companies utilizing Die Casting get benefit from the reduction of stamp production time, reduction of delays due to longer stamp service life, AND reduction of cost (good surface finish with no need for further refining)
- Some **drawbacks** in CMRDI include:
  - Bureaucracy and delivery times
  - Services need more effective Marketing and announcement

- Research budget needs to increase in the area of Die Casting Technology as requested by the Egyptian International Company for Metal Technology
- In some instances CMRDI needs the support of foreign trainers
- CMRDI also needs physical component sections and models to help illustration of the sophisticated equipment such as the die casting machine.
- Capacity of Die Casting needs to increase from 250 tons to 400 tons based on the requirements of the interviewed companies.
- It is also needed to be supported with a machine to manufacture Zinc with Titanium as required by the interviewed companies and the market needs.
- Cold Box Technology has been utilized in Loloa Co. since 2006. A contract to manufacture chain pieces at a rate of 250 pieces / month is ongoing. The contract was increased from producing 1500 to 2100 in total. Other records in the same field showed services provided to Mansoura Co. for resins and it was not evidenced the type of service provided.
- Feedback from beneficiaries such as the Egyptian International Co. showed small technical support from the Cold Box Technology.

## VI. CONCLUSIONS

### **From the data and information collected, the following was concluded:**

#### **(1) Impact**

CMRDI have been making their efforts to improve their service and increased their customers from 37 to 56 companies after termination of the Project. The continuation of its old clients proves satisfactory performance with no complaints collected during the period. This matches well with the overall goal.

No data was available to indicate positive impacts related to CMRDI's activities and its contribution to export. In addition, neither reports nor statistics were found to prove how much extent the Project contributed to change of Egyptian metal processing industry.

Companies which benefited from CMRDI gained more revenues applying new technologies (MOG), reduction in rejected products (Three Brothers), and increase in production (EMCO) as well as reduction in product costs and production time.

Small enterprises have higher impacts on their performance in Die Casting Technology as evidenced by (Egyptian International) which their market share increased from 3.3% to almost 20%.

Newly adopted services were few. These were found in each area of the project except for the High Pressure die casting.

Generally the companies did not provide any impact on export figures but rather improvement in their production competencies in the local market.

Recently the Government of Egypt has been carrying out privatization of state-owned enterprises. But so far there were no privatized state-owned companies among the beneficiaries of CMRDI. So the trend of privatization does not seem to affect CMRDI.

Employment trend was only observed in one small company (Egyptian International)

#### **(2) Sustainability**

There is no difficulty for sustaining the continuation of the service provided from the financial point of view. The government budget covers up to 30 % of CMRDI's expenses. CMRDI's service fees covers all other expenses including maintenance and repairs, labor fees and material costs which are needed for their service or maintenance.

Institutionally, CMRDI efforts in increasing their own staff and actually hired 5 new staff. But two out of eleven (18%) counterparts who were trained in Japan during the Project period already left CMRDI, while the rest are still in CMRDI and trying to enhance the result of the Project. The final balance shows 27% increase. Nevertheless, more staff is needed in the material evaluation area according to the in-depth interview with CMRDI officials.

No future plans were provided by CMRDI to compare targets with achievements then consequently no plans were provided for future needs in the short term (3-5 years).

Because of this lack of information, the evaluation team could not confirm the strategy or direction of CMRDI as an institution. Therefore it would be agreed that the sustainability as an institution has room to be improved since there is no clear short-term planning, although the staff is strengthened with almost no problem.

From the technical point of view, the availability of the equipment is there on the requested service.

### **Factors that have promoted project**

#### **(1) Impact**

A very good factor that has promoted the Project is in fact the market needs for specific technologies such as ADI and Laser Cutting.

This has boosted their applications in the different related industries and increased the number of cases of CMRDI's service.

Because of the tangible results such as reduction in rejects, technology transfer during the Project was encouraged

#### **(2) Sustainability**

The fact that CMRDI's budget was secured enough promoted the sustainability of the Project.

Since their services are adequately set, the fee of them covers production costs, maintenance, labor and salary for the relevant areas in CMRDI.

This fee structure also promoted the financial sustainability of the Project. Maintenance plans on monthly and weekly bases are executed.

This promoted the availability of the equipment and contributed to enhancement of the technical sustainability.

### **Factors that have inhibited project**

#### **(1) Impact**

Although capabilities in failure analysis are available, they are only directed to research works rather than services to companies. The effective use of the technology is not reflected in the relevant industries due to the high expenses of such analyses from the point of view of benefited companies. The companies request this technology for their researches in coordination with CMRDI.

The marketing and announcement of CMRDI's services were not effective enough. According to the in-depth interview with companies, all of the six interviewed companies are not fully aware of the programmed services and activities as well as schedule of the training.

The associations have no monitors to the programs provided by CMRDI to provide to their member companies..

The research budget needs to increase in some areas like die casting as per market needs.

#### **(2) Sustainability**

From the interviews and focus group discussion it was shown that Failure Analysis represents a service of high cost to the beneficiaries, especially fatigue testing after treatment of critical components. Therefore the service is directed to researches where the beneficiaries afford to cover the expenses. As a result, this kind of service is not supported adequately from the finance point of view which may cripple its continuation.

The number of employees in the area of material evaluation is not enough to meet the requirements of the beneficiaries.

Figures and facts that support the conclusions are detailed in the result section.

## VII. RECOMMENDATIONS

Center for Metallurgical and Research Development Institute (CMRDI), although a very effective institute in research, training and development, requires the following as rooms for performance improvement:

1) A sound business or similar strategic plan that is based on specific mission and vision of the institute. The plan specifies their short-term future programs and activities, states specific targets and assumes the needed budget and resources, and the means of provision which ensures the sustainability of the project. This plan will help performance control (follow-up) and evaluation such as the current ex-post evaluation. The plan should be developed by CMRDI staff.

2) An accurate database and records that keeps track of:

- Researches and pilot Projects provided
- Recorded services provided.
- Recorded training programs provided.
- A root cause analysis of unaccepted services and the applied corrective and preventive actions
- Newly adopted services provided
- Staff qualifications and development programs
- Data of economic nature that are linked to benefited companies and which serve as client feedback of CMRDI performance evaluation (Employment trends, market share, production, quality and other competencies, export and import figures..). These data represent the effective impacts on the status of the companies
- Records of maintenance and equipment breakdown

The availability of such reliable data would have helped in establishing an overall picture of the performance after termination and the impact in change of the Metal Processing Industry in Egypt. This is recommended to be established by CMRDI institute.

3) Effective coordination with associations and member companies in the relevant fields. This would strengthen the link between the institute and the real market as it monitors the progress of the industry, the difficulties which the companies face, and the volume of needed services. Coordination should be established by CMRDI staff.

4) Data link with Governmental bodies and stakeholders with common interest, e.g. State Ministry of Scientific Research and Ministry of Trade and Industry and Ministry of Investment on issues such as ( Employment, trend of privatized companies, export and import figures,..). This is mutually recommended from both parties.

5) Services need more effective Marketing and announcement especially in the field of training and services provided. For example training courses in the field of Laser Cutting need to keep the same pace they have during project period. Only 4 programs were recorded from 2004 to 2007. In some instances CMRDI needs the support of foreign trainers for enhanced technology especially in the field of die casting. This might be planned and organized by CMRDI.

7) Awareness and promoting fatigue analysis and its importance in ensuring the product quality and service life need to be expanded and included in CMRDI programs to

encourage companies improve their product and support the facility in the same time.

8) The estimated period of the ex-post study needs to be extended and the eight week plan requires to take into consideration the official holidays and events in addition to other requirements and constraints from JICA. The plan needs to be full working days.

## **VIII. LESSONS LEARNED**

To plan and implement this kind of technical cooperation project, it is important that the implementing agencies of recipient countries should be chosen on the fact that they have a keen awareness of market orientation and improving management system.

Without market orientation, even if some technology is enhanced in within an implementing agency, the knowledge and technology will not be disseminated widely out of the organization, which is intention of the neither recipient country nor JICA.

The management system is important for assuring the implementation agency to improve its productivity and quality of performance and consequently enable to provide customer oriented services to wide range of beneficiaries.

The management system should be established in the agency relying on databases and records of the organization itself. This kind of information is also crucial for future studies such as ex-post evaluation.

Effective communication with different stakeholders is required to make most of the input of the project. An implementing agency of a recipient country should nominate some staff for this task as contact officers and ask different relevant bodies to do the same. It will facilitate coordination and planning of activities.



## **Annexes**

## Annex 1

## Evaluation Summary

## Evaluation conducted by: JICA Egypt Office

<b>1. Outline of the Project</b>	
Country : Egypt	Project title : Upgrading of Metal Processing Technology in Egypt (2000-2004)
Issue/Sector : Industry/General	Cooperation scheme : Technical Cooperation
Division in charge : JICA Egypt Office	Total cost : 930,026,000 yen
Period of Cooperation	2000 - 2004
	Partner Country's Implementing Organization : Central Metallurgical Research and Development Institute (CMRDI)
Related Cooperation	Supporting Organization in Japan : Senior Volunteer (Total Plant Maintenance, 2006-2008)
<b>1-1. Background of the Project</b>	
<p>Since 1991, the government of Egypt (GOE) has made efforts of economic reform, and achieved financial sustainability and high growth of GDP. But the supporting industries which should have an important role of supplying materials and parts were still suffering from lack of rather basic technologies and methodologies of quality management. Therefore GOE requested the Government of Japan (GOJ) to implement a project to strengthen the technology of Central Metallurgical Research and Development Institute (CMRDI). The mission of the institute itself is to enhance the competitiveness of the Egyptian industry and the welfare of the society through technological development and technology transfer to Egyptian companies.</p> <p>GOJ dispatched several study teams, and then Record of Discussions (R/D) was signed in April 2000 by Egyptian side and Japanese side to agree with the framework of "The Project on Upgrading of Metal Processing Technology in Arab Republic of Egypt" (hereinafter referred to as "the Project"). The Project started in October 2000 and ended in September 2004.</p> <p>The Terminal Evaluation was implemented jointly by Egyptian side and Japanese side in September 2004, just before the termination of the Project's period of cooperation. The evaluation report mentioned as conclusion that the Project had been successfully implemented regardless of many inhibiting factors in efficiency, on the other hand, among a number of the factors that had contributed to the success of the Project, the commitment of the highly motivated C/Ps and Japanese experts was of particular significance.</p>	
<b>1-2. Project Overview</b>	
<p>In the long run, the project overall goal is to upgrade the technical capability for production of metal processing industries in Egypt. To achieve this goal, Japan International Cooperation Agency (JICA) and CMRDI implemented the technical cooperation project to improve CMRDI's capacity of metal processing technology.</p> <ul style="list-style-type: none"> <li>▪ <b>Overall Goal</b> Technical capability for production of metal processing industries in Egypt is upgraded.</li> <li>▪ <b>Project Purpose</b> Technical services for metal processing industries extended by CMRDI are upgraded.</li> <li>▪ <b>Outputs</b> Project operation unit is enhanced <ol style="list-style-type: none"> <li>1. Necessary machinery and equipment are provided, installed, operated and maintained properly.</li> <li>2. Technical capability of the counterpart personnel (hereunder referred to as C/P) is upgraded.</li> <li>3. Technical services for metal processing industries are provided.</li> </ol> </li> </ul>	

<p>▪ <b>Inputs (as of the Project's termination in yen)</b></p> <p><b>Japanese side :</b></p> <p><b>Dispatch of Experts</b></p> <p>(Long Term Expert : 6 , Short Term Expert: 47)      495 million</p> <p><b>Acceptance of C/P in Japan</b>      6 million</p> <p><b>Equipment</b>      385 million</p> <p><b>Dispatch of Study Team</b>      17 million</p> <p><b>Local Cost Support</b>      27 million</p> <p><b>Grand Total</b>      <b>930 million</b></p> <p><b>CMRDI's Side : (in L.E. 1 LE = 30 yen as of September 2004)</b></p> <p><b>Facilities (air conditioners and others)</b>      225,000</p> <p><b>Materials and tools</b>      460,000</p> <p><b>Custom clearance and transportation</b>      134,000</p> <p><b>Others</b>      106,000</p> <p><b>Grand Total</b>      <b>925,000</b></p>		
<b>2. Evaluation Team</b>		
<b>Members of Evaluation Team</b>	El-Zanaty & Associates under contract with JICA Egypt Office	
	Dr. Fatma EL Zanaty	Team Leader
	Dr. Sarah El Reffae	Principal investigator
	Eng. Sherin El Kordy	Industrial Expert
	Eng. Mohameed Abul Nour	Industrial Auditor
<b>Period of Evaluation</b>	<b>Day/ month/ Year - Day/ month/ Year</b>	<b>Type of Evaluation : Ex-post</b>
	1/12/2007 to 1/2/2008	
<b>3. Project Performance</b>		
<b>3-1. Performance of Project Purpose</b>		
<p>Technical services for metal processing industries provided by CMRDI are upgraded to include the five areas of the Project.</p> <ol style="list-style-type: none"> <li>1. Control of mechanical properties and quality control</li> <li>2. Casting</li> <li>3. Heat treatment</li> <li>4. Fatigue evaluation of welded joint</li> <li>5. Laser cutting</li> </ol> <p>Several companies, especially small enterprises, have benefited from these services according to the in-depth interviews implemented to companies. The number of companies which benefited from CMRDI during the project was 37. The number increased by 19 new companies after termination and now 56 companies get services from CMRDI. This indicates that the clients are satisfied with the services from CMRDI as no complaints were collected. In order to analyze the level of satisfaction of served beneficiaries, questionnaires were delivered to 12 companies of different sizes from ESLIA (Egyptian Society for Laser Industrial Applications), EDCC (Egyptian Die Casting Chapter) but were not replied. Then instead of using the answers of the questionnaires, the evaluation team conducted the in-depth interviews with six (6) companies and CMRDI executives and staff.</p> <p>The recorded services provided by CMRDI since termination were 113 services. This number includes researches, projects, testing and evaluation services.</p> <p>There were 4 newly adopted services, one in each area except for the High Pressure die casting.</p> <p>Several companies gained more revenues applying new technologies (MOG), reduction in rejected products (Three Brothers), increase in production (EMCO), and reduction in product costs or reduction in production time. Nevertheless, there were no collective figures to evidence the Overall Project Goal indicators of the industry at CMRDI, ESLIA or EDCC top managements.</p> <p>Small enterprises have higher impacts on their performance in Die Casting Technology as evidenced by (Egyptian International). Their market share increased from 3.3% to almost 20%.</p> <p>In general, the companies have gained no impact on export figures but rather improvement in their</p>		

production competencies in the local market.

Recently the Government of Egypt has been carrying out privatization of state-owned enterprises. But so far there were no privatized state-owned companies among the beneficiaries of CMRDI. So the trend of privatization does not seem to affect CMRDI.

Employment increase is only observed in one small company (Egyptian International)

### **3-2 . Achievement related to Overall Goal**

It is hard to collect reports and data which reflect the contribution of the project to the change of Egyptian industry, and consequently it is difficult to tell. The available records from CMRDI, ESLIA, or EDCC did not support the impact from the perspective of the beneficiaries. Overall figures concerning the market share of the beneficiaries, the change in production costs or increase in productivity were not available.

The evaluation team relied on the in-depth interviews and focus group discussions with CMRDI staff as well as ESLIA member companies to establish a picture of this impact. So the indicators and means of Overall Goal should be more carefully determined at the terminal evaluation or earlier stage.

### **3-3 . Follow-up of the Recommendations by Terminal Evaluation Study**

#### 1) Regular Maintenance

1-1) Recommendation of Terminal Evaluation: CMRDI should practice regular maintenance and operational tests of machines/equipment to keep them under working condition constantly.

1-2) Follow-up situation : CMRDI practices regular maintenance and operational tests of machines/equipment.

#### 2) Maintenance Records

2-1) Recommendation of Terminal Evaluation: CMRDI should insure that staff members keep maintenance records and make operational reports to secure traceability in preparation for such events as machine troubles.

2-2) Although CMRDI insure that staff members keep maintenance plans, records of breakdowns and analysis were not evidenced.

#### 3) Communicational Opportunities

3-1) Recommendation of Terminal Evaluation : CMRDI should continue to provide communicational opportunities among different technical groups and within each group, and monitor communicational status regularly at CMRDI to optimize its capabilities to cater for ever-growing and sophisticated demands from industries.

3-2) Follow-up situation: CMRDI needs intensive marketing effort among the relevant beneficiaries as well as regular announcement of their programs to maximize their service provision.

#### 4) Development and Improvement of Teaching Materials

4-1) Recommendation of Terminal Evaluation: CMRDI should continue to develop, improve and further utilize its teaching materials for technical services to cater for ever-growing and sophisticated demands from its clients.

4-2) Follow-up situation: CMRDI continued to develop, improve and further utilize its teaching materials for technical services, sometimes it needs the help of foreign experts.

#### 5) Categorization and Analysis of Case Data

5-1) Recommendation of Terminal Evaluation: CMRDI should start analyzing, categorizing and accumulating case data obtained through each technical service systematically, so that young and inexperienced engineers could cope with ever-growing demands from its clients within their capacities.

5-2) Follow-up situation: CMRDI did not evidence analyzing, categorizing and accumulating case data obtained through each technical service.

6) Establishment of New Associations

6-1) Recommendation of Terminal Evaluation: CMRDI should continue to take the initiative to establish new technical associations as platforms to disseminate and share information of metal processing technologies among private/public companies and researchers, and strengthen the role of CMRDI for industries.

6-2) Follow-up situation : No new associations were established and old associations (ESLIA, EDCC) are not effective in that basic information and databases for the member companies and their technical aspects were not established. In addition, monitoring their economic progress was not developed.

7) Safety Measures

7-1) Recommendation of Terminal Associations: CMRDI should continue to take safety measures and give safety instructions to its employees at CMRDI premises.

7-2) Follow-up situation: The general activities at CMRDI follow the normal safety measures introduced by routine instructions. These instructions are presented to the relevant employees

8) Environmental Precautions

8-1) Recommendation of Terminal Associations: CMRDI should continue to take necessary measures to carry out its operations in environmentally sound manner.

8-2) Follow-up situation: The general activities at CMRDI keep the minimum requirements to carry out its operations in adequate atmosphere. Still, it is needed to carry out a formal evaluation of the aspects and impacts associated with their activities.

#### **4. Results of Evaluation**

##### **4-1. Summary of Evaluation Results**

###### **(1) Impact**

CMRDI have been making their efforts to improve their service and increased their customers from 37 to 56 companies after termination of the Project. Some of the companies CMRDI offered the service experienced impacts such as increase of revenue by applying new technologies, reduction in rejected products, increase in production, reduction in products costs, and reduction in production time. No data was available to indicate positive impacts related to CMRDI's activities and its contribution to export. Also, neither reports nor statistics were found to prove how much extent the Project contributed to change of Egyptian metal processing industry. The provided data are from individual companies, such as (Egyptian International) which increased their market share from 3.3% to 20%. As previously mentioned, these data are difficult to verify through official reports or statistics. The indicators and means of verification of Overall Goal in PDM should have been more carefully determined at the terminal evaluation stage or earlier stage.

###### **(2) Sustainability**

In general, it was agreed that there is no difficulty for sustaining the continuation of the service provided from the financial point of view. The government budget covers up to 30 % of CMRDI's expenses. CMRDI's service fees covers all other expenses including maintenance and repairs, labor fees and material costs which are needed for their service or maintenance. Institutionally, CMRDI efforts in increasing their own staff and actually hired 5 new staff. But two out of eleven (18%) counterparts who were trained in Japan during the Project period already left CMRDI, while the rest are still in CMRDI and trying to enhance the result of the Project. The final balance shows 27% increase. Nevertheless, more staff is needed in the material evaluation area according to the in-depth interview with CMRDI officials. No future plans were provided by CMRDI to compare targets with achievements then consequently no plans were provided for future needs in the short term (3-5 years). Because of this lack of information, the evaluation team could not confirm the strategy or direction of CMRDI as an institution. Therefore it would be agreed that the sustainability as an institution has room to be improved since there is no clear short-term planning, although the staff is strengthened with almost no problem. From the technical point of view, the availability of the equipment is there on the requested service.

##### **4-2. Factors that have promoted project**

###### **(1) Impact**

A very good factor that has promoted the Project is in fact the market needs for specific technologies such as ADI and Laser Cutting. This has boosted their applications in the different related industries and increased the number of cases of CMRDI's service. Because of the tangible result such as reduction in rejects, technology transfer during the Project was encouraged

###### **(2) Sustainability**

The fact that CMRDI's budget was secured enough promoted the sustainability of the Project. Since their services are adequately set, the fee of them covers production costs, maintenance, labor and salary for the relevant areas in CMRDI. This fee structure also promoted the financial sustainability of the Project. Maintenance plans on monthly and weekly bases are executed. This promoted the availability of the equipment and contributed to enhancement of the technical sustainability.

#### **4-3. Factors that have inhibited project**

##### **(1) Impact**

Although capabilities in failure analysis are available, they are only directed to research works rather than services to companies. The effective use of the technology is not reflected in the relevant industries due to the high expenses of such analyses from the point of view of benefited companies.

The marketing and announcement of CMRDI's services were not effective enough. According to the in-depth interview with companies, all of the six interviewed companies are not fully aware of the programmed services and activities as well as schedule of the training. The associations have no monitors to the programs provided by CMRDI to provide to their member companies..

The research budget needs to increase in some areas like die casting as per market needs.

##### **(2) Sustainability**

From the interviews and focus group discussion it was shown that Failure Analysis represents a service of high cost to the beneficiaries, especially fatigue testing after treatment of critical components. Therefore the service is directed to researches where the beneficiaries afford to cover the expenses. As a result, this kind of service is not supported adequately from the finance point of view which may cripple its continuation.

The number of employees in the area of material evaluation is not enough to meet the requirements of the beneficiaries.

#### **4-4. Conclusions**

The technical services provided by CMRDI have been extended to cover additional 19 new companies after termination. With 37 companies supported during the project period the number totaled 56 companies by the end of 2007. After termination, 113 different services as well as 35 training programs were conducted. Technical services include researches, pilot projects, and testing services. The companies benefited from the services experienced several impacts such as increase in revenues by applying new technologies, increase in productivity, reduction in product rejects, reduction in production costs and time. It is difficult to collect data that indicate positive impacts related to CMRDI's activities on export as well as reports or statistics that prove how much extent the project contributed to change of Egyptian metal processing industry. The evaluation team focused on in-depth interviews and focus group discussion to make the assessment.

Announcement of the services provided and training program schedules are not adequately deployed within the relevant beneficiaries.

In general, it was agreed that there is no difficulty for sustaining the continuation of the services from the financial point of view. According to CMRDI's staff the Government budget covers up to 30% of CMRDI's expenses. Other expenses are covered through CMRDI's own resources. Due to lack of future plans and information the evaluation team could not confirm the strategy or direction of CMRDI as an institution.

The high cost of failure analysis caused the companies to refrain from making use of this application especially in fatigue testing. Hence this application is used in the form of few researches coordinated with the benefited companies instead of being routine service provided by CMRDI.

The lack of awareness and training programs, especially on the importance of failure analysis of critical heat treated product, may decelerate the effective use of failure analysis technology.

**4-5. Recommendations**

Center for Metallurgical and Research Development Institute (CMRDI), although a very effective institute in research, training and development, requires the following as rooms for performance improvement:

- 1) A sound business or similar strategic plan that is based on specific mission and vision of the institute. The plan specifies their short-term future programs and activities, states specific targets and assumes the needed budget and resources, and the means of provision which ensures the sustainability of the project. This plan will help performance control (follow-up) and evaluation such as the current ex-post evaluation. The plan should be developed by CMRDI staff.
- 2) An accurate database and records that keeps track of:
  - Researches and pilot Projects provided
  - Recorded services provided.
  - Recorded training programs provided.
  - A root cause analysis of unaccepted services and the applied corrective and preventive actions
  - Newly adopted services provided
  - Staff qualifications and development programs
  - Data of economic nature that are linked to benefited companies and which serve as client feedback of CMRDI performance evaluation (Employment trends, market share, production, quality and other competencies, export and import figures..). These data represent the effective impacts on the status of the companies
  - Records of maintenance and equipment breakdown

The availability of such reliable data would have helped in establishing an overall picture of the performance after termination and the impact in change of the Metal Processing Industry in Egypt. This is recommended to be established by CMRDI institute.

- 3) Effective coordination with associations and member companies in the relevant fields. This would strengthen the link between the institute and the real market as it monitors the progress of the industry, the difficulties which the companies face, and the volume of needed services. Coordination should be established by CMRDI staff.
- 4) Data link with Governmental bodies and stakeholders with common interest, e.g. State Ministry of Scientific Research and Ministry of Trade and Industry and Ministry of Investment on issues such as ( Employment, trend of privatized companies, export and import figures,..). This is mutually recommended from both parties.
- 5) Services need more effective Marketing and announcement especially in the field of training and services provided. For example training courses in the field of Laser Cutting need to keep the same pace they have during project period. Only 4 programs were recorded from 2004 to 2007. In some instances CMRDI needs the support of foreign trainers for enhanced technology especially in the field of die casting. This might be planned and organized by CMRDI.
- 7) Awareness and promoting fatigue analysis and its importance in ensuring the product quality and service life need to be expanded and included in CMRDI programs to encourage companies improve their product and support the facility in the same time.
- 8) The estimated period of the ex-post study needs to be extended and the eight week plan requires to take into consideration the official holidays and events in addition to other requirements and constraints from JICA. The plan needs to be full working days.



**4-6. Lessons Learned**

To plan and implement this kind of technical cooperation project, it is important that the implementing agencies of recipient countries should be chosen on the fact that they have a keen awareness of market orientation and improving management system.

Without market orientation, even if some technology is enhanced in within an implementing agency, the knowledge and technology will not be disseminated widely out of the organization, which is intention of the neither recipient country nor JICA.

The management system is important for assuring the implementation agency to improve its productivity and quality of performance and consequently enable to provide customer oriented services to wide range of beneficiaries.

The management system should be established in the agency relying on databases and records of the organization itself. This kind of information is also crucial for future studies such as ex-post evaluation.

Effective communication with different stakeholders is required to make most of the input of the project. An implementing agency of a recipient country should nominate some staff for this task as contact officers and ask different relevant bodies to do the same. It will facilitate coordination and planning of activities.

**4-7. Follow-up Situation**

No follow-up activities are found so far.

## Annex 2

## Project Design Matrix (PDM)

## Ex-post Evaluation on Upgrading of Metal Processing Technology in the Arab Republic of Egypt project

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
<p style="text-align: center;"><b>Overall Goal</b></p> <p>To support JICA in better-informed decision making that is based on the lessons learned, plan programs in a similar context, and promote greater accountability. The results will also be shared by CMRDI.</p>	<ul style="list-style-type: none"> <li>• Evaluation of the impact of the project on the relevant industries in Egypt</li> <li>• Evaluation of the sustainability and progress of the project since termination</li> </ul>	<p>In depth evaluation study of the impact and sustainability</p>	<p>Commitment of CMRDI officers to the requirements provided by JICA</p>
<p style="text-align: center;"><b>Evaluation Purpose</b></p>			
<p>Ex-post evaluation of Upgrading of Metal Processing Technology in the Arab Republic of Egypt three years after the termination of the project</p>	<p><b>Impact</b></p> <ul style="list-style-type: none"> <li>• The extent to which the overall goal has been achieved since the terminal evaluation?</li> <li>• Observation of unintended positive and negative effects observed?</li> <li>• Factors that contribute to positive and negative impacts?</li> </ul> <p><b>Sustainability</b></p> <ul style="list-style-type: none"> <li>• Effectiveness of CMRDI in maintaining the project activities and services provided by the project</li> <li>• Maintenance of the project outcomes since the termination of assistance</li> <li>• Factors that contribute to or inhibit the project for sustainability</li> </ul>	<ul style="list-style-type: none"> <li>• In-depth interviews</li> <li>• Focus Group Discussions</li> <li>• Questionnaires</li> </ul>	<ul style="list-style-type: none"> <li>• Commitment of CMRDI officers to the requirements provided by JICA</li> <li>• Commitment of CMRDI and Zanaty Associates to the agreed requirements provided by Zanaty to CMRDI in the opening visit</li> <li>• Full coordination of CMRDI with the different parties requested to set for the study according to the agreed plan between CMRDI and Zanaty</li> </ul>

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
<b>Outputs</b>			
1. Evaluation Grid, 2. Evaluation Report, 3. Evaluation Summary Report.	Reports and reviews	Scheduled reporting by Zanaty and review by JICA according to the agreed milestones	Full support of CMRDI in terms of: <ul style="list-style-type: none"> <li>• Parties coordination and preparation</li> <li>• Preparation of the different visits and interviews with the different parties</li> <li>• Provision of data and information required by Zanaty and issued to CMRDI</li> <li>• Assistance and facilitation of JICA</li> </ul>

Activities	Inputs	
<p><u>In-Depth Interviews conducted with:</u></p> <ol style="list-style-type: none"> <li>1- Managers In CMRDI</li> <li>2- Counterparts trained in Japan</li> <li>3- New staff in CMRDI</li> <li>4- ESLIA, EDCC Associations representatives</li> <li>5- Officers from the Ministry of Scientific Research who are related/responsible for the project</li> <li>6- Officers from the Ministry of Trade and Industry who are related/responsible for the project</li> </ol>	<ol style="list-style-type: none"> <li>1-Basic Information about benefited companies and Associations (numbers, services, cases, projects ...)</li> <li>2- Strategic ( Targets and future plans, financial support, budget, organizational, employment ..)</li> <li>3- Technical (Equipment availability, Testing instruments, ..)</li> <li>4- Development (Training, trends, new technologies, educational resources,..)</li> <li>5- Quality and Management Systems (Environmental, Safety,..)</li> <li>6- Data on services and training provided by CMRDI including researches ( Number, types, evaluation,..)</li> <li>7- Data on member companies (number, size, type,..)</li> <li>8- Data on Export and local market share (impact of competency building and services provided)</li> <li>9- Impact on privatized companies (number, development,..)</li> <li>10- Strategy as to utilize CMRDI and future plans (Mission, Objective and Targets, plans for researches and pilot projects,..)</li> <li>11- Future needs analysis for CMRDI (organizational, facilities,..)</li> <li>12- Financial Support and budgeting for sustainability</li> </ol>	<ul style="list-style-type: none"> <li>• Parties abide by agreed scheduled</li> <li>• Availability of documented input data</li> <li>• Integrity and accuracy of Data</li> <li>• Control of CMRDI on the different parties</li> </ul>

Activities	Inputs	
<p><u>Focus groups conducted with:</u></p> <ol style="list-style-type: none"> <li>1- Staff in CMRDI</li> <li>2- Engineers/Senior Technicians</li> <li>3- Engineers trained in CMRDI and work in Public sector</li> <li>4- Engineers trained in CMRDI and work in Private sector</li> <li>5- Operators trained in CMRDI and work in Public sector</li> <li>6- Operators trained in CMRDI and work in Private sector</li> <li>7- Technicians in Maintenance</li> <li>8- Undergraduate trainees (if any)</li> </ol> <p><u>Questionnaires distributed to the relevant groups</u></p> <ol style="list-style-type: none"> <li>1- 10% of the member companies in ESLIAA and EDCC</li> <li>2- 10% of the trainees</li> <li>3- 3 Engineers</li> <li>4- 6 Senior technicians (among which 2 from maintenance)</li> </ol>	<ol style="list-style-type: none"> <li>1- Data on the companies and services provided including researches and piloting</li> <li>2- Impact on the competencies of benefited companies</li> <li>3- Training programs and analysis (companies)</li> <li>4- Contract progress with the different companies</li> <li>5- Availability of equipment and testing device</li> <li>6- Financial support analysis for operations and maintenance</li> <li>7- Companies new capabilities acquired from the services provided by CMRDI</li> <li>8- Training evaluation of new technologies by the trainees</li> <li>9- Progress of contracts and agreements with CMRDI</li> <li>10- Maintenance plans/execution</li> <li>11- Risk assessment and Safety awareness</li> </ol>	

**Annex 3**  
**Evaluation Grid**

Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method	
Main Questions	Sub-questions					
<b>Impact</b>	1- How far has the overall goal been achieved since the terminal evaluation?	<ul style="list-style-type: none"> <li>- What are the sizes and number of Companies of Egyptian Industries that benefited from CMRDI researches or pilot projects?</li> <li>- What is the number of new services developed by CMRDI?</li> <li>- What is the impact of this services on the competences of the companies?</li> <li>- What are the new capabilities acquired by Companies of Egyptian Industries ?</li> <li>- How does the trend of export figures of new products in the relevant Companies of Egyptian Industries reflect the utilization of new technologies ?</li> <li>- What is the impact on the economic value of the privatized firms ? (change in market share, overall profits, change in product quality and value, export figures,..)</li> </ul>	<ul style="list-style-type: none"> <li>- Positive increase in number and size</li> <li>- Positive increase in new services</li> <li>- Increase market share</li> <li>- Improved value</li> <li>- Increased number</li> <li>- Improvement in export figures</li> </ul>	<ul style="list-style-type: none"> <li>- Number and sizes of benefited Companies of Egyptian Industries</li> <li>- Number of newly developed services by CMRDI?</li> <li>- Percentage of market increase of the companies</li> <li>- Product value change</li> <li>- Number of developed Companies of Egyptian Industries</li> <li>- Export figures of new products</li> </ul>	Records at CMRDI	IDI Focus group

Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method	
Main Questions	Sub-questions					
<b>Impact</b>	2- Are the unintended positive and negative effects observed?	<ul style="list-style-type: none"> <li>- Is the trend of training programs observed and analyzed?</li> <li>- What is the progress of contracts held with the different firms?</li> <li>- What is number of staying qualified employees in CMRDI since the terminal evaluation?</li> <li>- How does the breakdown analysis of equipment reflect the availability of equipment and testing devices?</li> <li>- How is the root cause analysis performed? Corrective actions taken and what are the results?</li> <li>- How is the progress of the cost recovery plan?</li> <li>- How is financial support for operations and maintenance planned and executed? ( governmental, foreign and service fees )</li> <li>- How adequate is the fee of provided services?</li> <li>- How is employment in the relevant industries affected?</li> <li>- What is the result of employment trend analysis?</li> <li>- Are unacceptable services traceable?</li> </ul>	Effects are documented	<ul style="list-style-type: none"> <li>- Trend analysis of training</li> <li>- Number, types and sizes of companies</li> <li>- Percentage of qualified staff since 2004 staying</li> <li>- Number of developed Companies of Egyptian Industries</li> <li>- Number of breakdowns and availability, Mean Time Between Failures (MTBF)</li> <li>- Root Cause Analysis, improvement trend</li> <li>- Progress of Cost Recovery plan</li> <li>- Financial Support Plan and service fees analysis</li> <li>- Employment trend analysis</li> <li>- Availability of operating equipment</li> <li>- Documented unsatisfactory service</li> </ul>	Records at CMRDI	IDI

Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method	
Main Questions	Sub-questions					
<b>Impact</b>	3- What positive and negative impacts has the project resulted in besides what were originally intended?	<ul style="list-style-type: none"> <li>- Are there statistical analysis for troubles and machine problems ?</li> <li>- What are other lab tests added to CMRDI services?</li> </ul>	Impacts are documented	<ul style="list-style-type: none"> <li>- Number of newly developed services by CMRDI</li> <li>- Number of added lab tests</li> <li>- Number of breakdowns and availability, Mean Time Between Failures (MTBF)</li> <li>- Progress of Cost Recovery plan</li> <li>- Financial Support Plan and service fees analysis</li> <li>- Availability of operating equipment</li> </ul>	Records at CMRDI	IDI



Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method	
Main Questions	Sub-questions					
<b>Impact</b>	<p>4- Among positive changes made, how has the project implementation empowered the target group economically and socially? Has the project contributed to the improved institutional capacity of the implementing agency?</p>	<ul style="list-style-type: none"> <li>- What are the impact of the services provided by CMRDI on the competencies of the benefited companies in terms of market share increase and value of product?</li> <li>- What is the number of newly developed associations?</li> <li>- What is the impact of training on new technologies?</li> <li>- What are the new technical capabilities acquired by Companies of Egyptian Industries in the relevant industries?</li> <li>- What is the export figures of the new products utilizing the new technologies?</li> <li>- What is the impact of provided services and technologies on the employment in the relevant industries?</li> </ul>	<ul style="list-style-type: none"> <li>- Increased market share</li> <li>- Improvement employment</li> </ul>	<ul style="list-style-type: none"> <li>- Percentage of market increase of the agencies</li> <li>- Product value change</li> <li>- Number of newly developed associations since 2004</li> <li>- Number of training course son new trends and technology since 2004</li> <li>- Number of developed Companies of Egyptian Industries</li> <li>- Employment trend analysis</li> </ul>	Records at CMRDI	Focus group
	<p>5- What negative changes have been brought to the beneficiaries, including minority and vulnerable group ? Has the project negatively contributed to the promotion of environmental and societal development; in particular in the sector of capacity development of human resources and private institution?</p>	<ul style="list-style-type: none"> <li>- What is the impact of training delivered by CMRDI on employment ?</li> <li>- How is employment in the relevant industries affected?</li> <li>- What is the result of employment trend analysis?</li> </ul>	<ul style="list-style-type: none"> <li>- Improved employment</li> <li>- Improved efficiency</li> </ul>	<ul style="list-style-type: none"> <li>- Change in employment of the relevant industries</li> </ul>	State Data at Ministry of Scientific Research	IDI

Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method	
Main Questions	Sub-questions					
Impact	6- Are there any external factors that influenced the achievement of the project overall goal?	<ul style="list-style-type: none"> <li>- How is the progress of the cost recovery plan?</li> <li>- How is financial support for operations and maintenance planned and executed? ( governmental, foreign and service fees )</li> <li>- How adequate is the fee of provided services?</li> </ul>	Analyzed economic and external factors	<ul style="list-style-type: none"> <li>- Progress of Cost Recovery plan</li> <li>- Financial Support Plan and service fees analysis</li> </ul>	Records at CMRDI	IDI
	7- What factors contributed to positive and negative impacts?	<ul style="list-style-type: none"> <li>- How is financial support for operations and maintenance planned and executed? ( governmental, foreign and service fees )</li> <li>- How adequate is the fee of provided services?</li> </ul>	Analysis of financial and other issues	<ul style="list-style-type: none"> <li>- Financial Support Plan and service fees analysis</li> </ul>	Records at CMRDI	IDI

		<b>Evaluating Questions</b>		<b>Achievement Criteria/Measures</b>	<b>Data Needed</b>	<b>Data Sources</b>	<b>Data Collection Method</b>
		<b>Main Questions</b>	<b>Sub-questions</b>				
<b>sustainability</b>	1-	How has the counterpart agency (CMRDI) been maintaining the project activities and services provided by the project?	<ul style="list-style-type: none"> <li>- How is financial support for operations and maintenance planned and executed? ( governmental, foreign and service fees )</li> <li>- Are there adequate preventive maintenance plans in place?</li> <li>- Are they properly implemented?</li> </ul>	Acceptable operating availability	<ul style="list-style-type: none"> <li>- Number of breakdowns and availability, Mean Time Between Failures (MTBF)</li> <li>- Preventive Maintenance plans and implementation evidences</li> <li>- Availability of operating equipment</li> </ul>	Records at CMRDI	IDI Focus Group
	2-	Have the project outcomes been maintained since the termination of assistance?	<ul style="list-style-type: none"> <li>- How many services have been administered by CMRDI to benefited firms?</li> <li>- How many training courses and programs have been delivered by CMRDI to different clients?</li> <li>- What is number of staying qualified employees in CMRDI since the terminal evaluation?</li> <li>- What is the number of projects and researches carried out by CMRDI since the terminal evaluation?</li> <li>- What is number and types of training programs provided by CMRDI to participants from private and public sectors?</li> <li>- How does the breakdown analysis of equipment reflect the availability of equipment and testing devices?</li> <li>- Are there adequate preventive maintenance plans in place?</li> <li>- Are they properly implemented?</li> </ul>	Sustained capacity of service provision	<ul style="list-style-type: none"> <li>- Number of services since 2004</li> <li>- Number of training courses provided</li> <li>- Percentage of qualified staff since 2004 staying</li> <li>- Equipment breakdown, availability</li> <li>- Number of projects and researches provided</li> <li>- Number and types of training programs provided by CMRDI to participants from private and public sectors</li> </ul>	Records at CMRDI	IDI Focus Group

	Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method
	Main Questions	Sub-questions				
sustainability	3- What factors are contributing to or inhibiting the project effects for sustainability?	<ul style="list-style-type: none"> <li>- How is the progress of the cost recovery plan?</li> <li>- Is there any plan for the current and future needs? Are adequate budget allocated for these needs?</li> <li>- How is financial support for operations and maintenance planned and executed? ( governmental, foreign and service fees )</li> <li>- How adequate is the fee of provided services?</li> </ul>	Analysis of financial and other issues	<ul style="list-style-type: none"> <li>- Retention rate (number of companies that refrain from using CMRDI services)</li> <li>- Progress of Cost Recovery plan</li> <li>- Current and Future needs plan</li> <li>- Financial Support Plan and service fees analysis</li> </ul>	Records at CMRDI	IDI Focus Group
	4- In addition, this evaluation intends to seek answers to the following specific questions:					
	a) To what extent CMRDI as an institution maintains the knowledge and technologies provided and transferred by Japanese experts during the Project?	<ul style="list-style-type: none"> <li>- How many services have been administered by CMRDI to benefited firms?</li> <li>- How many training courses and programs have been delivered by CMRDI to different clients?</li> <li>- How many firms have benefited from CMRDI services?</li> <li>- What are the sizes and number of Companies of Egyptian Industries that benefited from CMRDI researches or pilot projects?</li> </ul>	Improved economic value of the agencies	<ul style="list-style-type: none"> <li>- Number of services provided</li> <li>- Number and sizes of benefited agencies from (production in tons, agency economic value)</li> <li>- Their market share (individual and overall)</li> </ul>	Records at CMRDI	IDI

Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method	
Main Questions	Sub-questions					
sustainability	b) To what extent CMRDI as an institution develop the knowledge and technologies by their own efforts?	<ul style="list-style-type: none"> <li>- What is the number of new services developed by CMRDI?</li> <li>- What is the impact of this services on the competences of the companies?</li> <li>- What are the new quality and lab tests added to CMRDI services?</li> <li>- What is the number of training programs designed for new trends and technology?</li> </ul>	Increased number of newly developed services and training courses provided	<ul style="list-style-type: none"> <li>- Number of newly developed services by CMRDI</li> <li>- Number of lab tests added to CMRDI services</li> <li>- Number of new training courses since the termination evaluation</li> </ul>	IDI Focus Group	
	c) How many counterparts of the Project still remain in CMRDI and contribute to disseminate their knowledge and technology to the Egyptian industry?	<ul style="list-style-type: none"> <li>- What is number of staying qualified employees in CMRDI since the terminal evaluation?</li> <li>- What is the number of projects and researches carried out by CMRDI since the terminal evaluation?</li> </ul>	Report analysis	<ul style="list-style-type: none"> <li>- Percentage of staying qualified staff since 2004</li> <li>- Number of projects and researches provided</li> </ul>	Records at CMRDI	IDI Focus Group
	d) To what extent and by what means CMRDI contribute to the Egyptian industry utilizing the knowledge and technologies they got through the Project?	<ul style="list-style-type: none"> <li>- What is number and types of training programs provided by CMRDI to participants from private and public sectors?</li> <li>- What are the sizes and number of Companies of Egyptian Industries that benefited from CMRDI researches or pilot projects?</li> <li>- What is the feedback from the relevant firms on technical support provided by CMRDI?</li> </ul>	Increased number of developed Companies of Egyptian Industries and training programs	<ul style="list-style-type: none"> <li>- Number and types of training programs provided by CMRDI to participants from private and public sectors</li> <li>- Number of developed Companies of Egyptian Industries</li> <li>- Feedback and recommendations from agencies on technical support</li> </ul>	Records at CMRDI	Focus group discussion

	Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method
	Main Questions	Sub-questions				
sustainability	e) How the Egyptian industry evaluates the service of CMRDI in the fields of the technologies stipulated in '1-3 Technologies in the terms of reference (TOR) Transferred through the Project'?	<ul style="list-style-type: none"> <li>- How do companies evaluates services on                             <ol style="list-style-type: none"> <li>1. Control of mechanical properties</li> <li>2. Casting</li> <li>3. Heat treatment</li> <li>4. Fatigue evaluation</li> <li>5. Laser cutting</li> </ol> </li> <li>- What are the new capabilities acquired by Companies of Egyptian Industries?</li> <li>- What is the number of researches with the different agencies?</li> </ul>	Feedback analysis	<ul style="list-style-type: none"> <li>- Feedback evaluation on                             <ol style="list-style-type: none"> <li>1. Control of mechanical properties</li> <li>2. Casting</li> <li>3. Heat treatment</li> <li>4. Fatigue evaluation</li> <li>5. Laser cutting</li> </ol> </li> <li>- Number of researches conducted with agencies and associations</li> <li>- Number of developed Companies of Egyptian Industries</li> </ul>	Representatives from agencies, associations	Focus group discussion
	f) Does CMRDI maintain all the equipment provided during the Project and keep them utilizing frequently? If there is difficulty in maintenance, what is the cause and possible solution?	<ul style="list-style-type: none"> <li>- How does the breakdown analysis of equipment reflect the availability of equipment and testing devices?</li> <li>- How is the root cause analysis performed? Corrective actions taken and what are the results?</li> </ul>	Breakdown analysis	<ul style="list-style-type: none"> <li>- Root Cause Analysis, improvement trend</li> </ul>	Records at CMRDI	IDI
	g) Does CMRDI have sufficient budget to continue and develop its activities related to the project outputs?	<ul style="list-style-type: none"> <li>- Is there any plan for the current and future needs? Are adequate budget allocated for these needs?</li> </ul>	Budget and financial analysis	<ul style="list-style-type: none"> <li>- Current and Future needs plan</li> </ul>	Budget and financial support report	IDI
	h) GOE has been pushing forward the privatization of state-owned companies. Does this trend affect the number and nature of customers to whom CMRDI extends its service in the Project-related fields? If so, how?	<ul style="list-style-type: none"> <li>- How many privatized firms in the industry since the terminal evaluation?</li> <li>- What is the impact on the economic value of the privatized firms ? (change in market share, overall profits, change in product quality and value, export figures,...)</li> </ul>	Observation of privatized agencies	<ul style="list-style-type: none"> <li>- Number of privatized firms</li> <li>- Impact on economic value of firms (market share, overall profit, export figures)</li> </ul>	Records at CMRDI	IDI

	Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method
	Main Questions	Sub-questions				
sustainability	i) What is the current strategy of GOE on how to utilize CMRDI? What is the strategy of State Ministry of Scientific Research and Ministry of Trade and Industry concerning CMRDI?	<ul style="list-style-type: none"> <li>- Are Egyptian Industry and policy makers still interested in the technologies of the field of the Project?</li> <li>- Do Egyptian Industry and policy makers consider CMRDI as one of the most capable service providers?</li> <li>- What are the current and future targets of CMRDI?</li> <li>- What is the expected impact on the local market? Export?</li> <li>- How is employment in the relevant industries affected?</li> <li>- What is the result of employment trend analysis?</li> </ul>	Future plans	<ul style="list-style-type: none"> <li>- Future vision of Egyptian Industry for CMRDI utilization on the field of the Project</li> <li>- Future targets to be achieved by CMRDI</li> <li>- The expected impact on the local market (quantitative) and on Export</li> <li>- Employment trend analysis</li> </ul>	Future plans	IDI
Sustainability	j) To what extent does CMRDI practice regular maintenance and operational tests of machines and equipment to keep them under working condition constantly?	<ul style="list-style-type: none"> <li>- Are there adequate preventive maintenance plans in place?</li> <li>- Are they properly implemented?</li> <li>- What is the availability of operating equipment?</li> </ul>	Documented maintenance planning	<ul style="list-style-type: none"> <li>- Preventive Maintenance plans and implementation evidences</li> <li>- Availability of operating equipment</li> </ul>	Maintenance Plans and records at technical areas	Focus Group
	k) Does CMRDI keep maintenance records and make operational reports to secure traceability in preparation for such events as machine troubles?	<ul style="list-style-type: none"> <li>- Are unacceptable services and testing traceable to equipment?</li> <li>- Are there statistical analysis for troubles and machine problems ?</li> <li>- Are the research test results documented?</li> <li>- Are calibration records of testing and measuring devices available?</li> </ul>	Breakdown analysis	<ul style="list-style-type: none"> <li>- Documented unsatisfactory service</li> <li>- Frequency analysis of machine trouble and problems</li> <li>- Tests results of researches</li> <li>- Calibration plan and data</li> </ul>	Records at CMRDI Calibration records	Focus Group

	Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method
	Main Questions	Sub-questions				
Sustainability	l) Does CMRDI continue to provide communicational opportunities among different technical groups and within each group? And does CMRDI monitor communicational status regularly to optimize its capabilities to cater for ever-growing and sophisticated demands from industries?	<ul style="list-style-type: none"> <li>- What are the means of employees involvement in improvement?</li> <li>- What are the communication means with the companies, associations, ..others?</li> </ul>	List	<ul style="list-style-type: none"> <li>- List of communication means</li> <li>- Field visits and meetings schedules</li> </ul>	List	IDI
	m) Has CMRDI already started analyzing, categorizing and accumulating case data obtained through each technical service systematically?	<ul style="list-style-type: none"> <li>- Are case data categorized and analyzed?</li> <li>- What are the preventive actions taken for inferior services provided for members of associations?</li> </ul>	Case data	<ul style="list-style-type: none"> <li>- Case data records and categories</li> <li>- Analyses of case data</li> </ul>	Case data records	IDI
	n) Did CMRDI take the initiative to establish new technical associations as platforms to disseminate and share information of metal processing technologies among private and public companies and researchers, and strengthen the role of CMRDI for the industries? What is the result?	<ul style="list-style-type: none"> <li>- What is the number of new associations developed since the terminal evaluation?</li> <li>- What are positive results produced by these formation?</li> <li>- What are the suggestions proposed by these associations?</li> <li>- What is the feedback and results?</li> <li>- What is the impact of product quality (value increase, price, market share)?</li> </ul>	Increased number of diversity of associations	<ul style="list-style-type: none"> <li>- Number of associations developed since 2004</li> <li>- Number of member companies who joined the newly developed associations</li> <li>- Feedback and suggestions/recommendations from agencies</li> <li>- Market value progress</li> <li>- Number of new products</li> <li>- Value of improved products</li> </ul>	Association reports	IDI



	Evaluating Questions		Achievement	Data Needed	Data Sources	Data Collection
	Main Questions	Sub-questions	Criteria/Measures			Method
Sustainability	o) Does CMRDI continue to take safety measures and give safety instructions to its employees at CMRDI premises?	<ul style="list-style-type: none"> <li>- Is there systematic risk assessment for the activities performed by CMRDI?</li> <li>- Are there counter measures to prevent incidents / accidents and secure safe operation?</li> <li>- Is there emergency plan in place? Drills?</li> <li>- Are these drills analyzed in safety meetings?</li> <li>- Are awareness programs available?</li> </ul>	Safety system in place	<ul style="list-style-type: none"> <li>- Risk assessment analysis for CMRDI activities</li> <li>- Counter measures procedures to ensure safe operations at CMRDI</li> <li>- Emergency plans, drills and analysis</li> <li>- Safety meetings involved</li> <li>- Incidents/accidents reports and analysis</li> <li>- Awareness programs</li> </ul>	Safety planning and operation control	IDI
	p) Does CMRDI continue to take necessary measures to carry out its operations in environmentally sound manner?	<ul style="list-style-type: none"> <li>- Are aspects and impacts of the different activities assessed?</li> <li>- Are there any programs and procedures to mitigate these impacts?</li> </ul>	Environmental evaluation	<ul style="list-style-type: none"> <li>- Aspects and Impacts evaluation of CMRDI activities</li> <li>- Programs and procedures to eliminate or mitigate impacts</li> </ul>	Impact assessment and operation control	IDI
	q) In case the considerable number of counterparts already left CMRDI and new staff came as instead, what kind of training CMRDI provides to them in order to let them get the technology?	<ul style="list-style-type: none"> <li>- What are the programs followed for qualification and induction of new hirees?</li> <li>- What are the training programs durations and evaluations?</li> </ul>	Training programs	<ul style="list-style-type: none"> <li>- Qualifications and Induction programs for new employees</li> <li>- Training programs, duration and evaluation</li> </ul>	Training plans and records	IDI
	r) Is the project organization capable of maintaining the benefits accrued as a result of achieving the project purpose and overall goals?	<ul style="list-style-type: none"> <li>- Does the organization structure fulfill the functions proposed by the project?</li> </ul>	Organization analysis	<ul style="list-style-type: none"> <li>- Sufficiency of workforce against required activities and fulfillment of vacancies</li> </ul>	Organization Chart	IDI
	s) How likely are the project outcomes to be maintained?	<ul style="list-style-type: none"> <li>- What percentage of unfulfilled activities as proposed by the project?</li> </ul>	Financial and external analysis	<ul style="list-style-type: none"> <li>- Future requirements and proposed plans</li> </ul>	Future plans	IDI

Evaluating Questions		Achievement Criteria/Measures	Data Needed	Data Sources	Data Collection Method	
Main Questions	Sub-questions					
Sustainability	<p>t) What are the factors that contributed/inhibit the sustainability of the project outcomes: such as appropriateness of project planning and technology transferred ; and external factors?</p>	<p>– What external economic factors might inhibit the sustainability of the project?</p>	<p>SWOT analysis</p>	<p>– SWOT analysis for the current situation in CMRDI</p>	<p>SWOT results and recommendations</p>	<p>IDI</p>

**Annex 4**  
**Process Formats**  
**Ex-Post Evaluation Survey of the Project on**  
**Upgrading of Metal processing Technology in Arab republic of Egypt**

**PROCESS FORMATS**

**In-Depth Interviews**

**In-Depth Interviews will be conducted with:**

- 1- Managers In CMRDI
- 2- Counterparts trained in Japan
- 3- New staff in CMRDI
- 4- ESLIA, EDCC Associations representatives
- 5- Officers from the Ministry of Scientific Research who are related/responsible for the project
- 6- Officers from the Ministry of Trade and Industry who are related/responsible for the project

- The in-depth interview will be conducted with the responsible officer.
- The interview runs by 2 facilitators , one manages the discussion and the second records the interview using the writing and /or cassette recording
- The duration of each session of in-depth interview will be almost 0.30-0.45 minutes
- Managers interviews will be conducted 1-2 days. Two categories will b interviewed in a day
- ***Total days needed for the in-depth interviews will be 3 days***
- The agreed questions of the evaluation grid will be used as a guidelines for the in-depth interviews
- Relevant records and reports will support information about the project
- The agreed questions of the evaluation grid will be used as a guidelines for the In-Depth Interviews discussion

**Focus Group discussions**

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**Focus groups will be:**

- 1- Staff in CMRDI
  - 2- Engineers/Senior Technicians
  - 3- Engineers trained in CMRDI and work in Public sector
  - 4- Engineers trained in CMRDI and work in Private sector
  - 5- Operators trained in CMRDI and work in Public sector
  - 6- Operators trained in CMRDI and work in Private sector
  - 7- Technicians in Maintenance
  - 8- Undergraduate trainees (if any)
- Each focus group will be composed of 4-8 members. It is better to be not less than 6 members of the same category
  - The duration of each session of the focus group will be almost 1-1.5 hour
  - The focus group members sit in a U-shape position with the facilitator in front of the U-shape
  - The focus group runs by 3 facilitators:
  - The first: manage the discussion
  - The second: record and report the discussion
  - The third: observe and record the attitudes and the impressions
  - Two focus group will be conducted in one day
  - ***Total days needed for the focus group discussions will be 3 days***

- The agreed questions of the evaluation grid will be used as a guidelines for the focus group discussion

### **Questionnaires**

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The Questionnaires will be distributed to the relevant groups under the control of CMRDI to be collected in due course.

- 10% of the member companies in ESLIAA and EDCC
- 10% of the trainees
- 3 Engineers
- 6 Senior technicians (among which 2 from maintenance)

N.B. Further efforts shall be through mutual agreement between Zanaty & Associates and CMRDI

## Annex 5

### Quantitative findings in CMRDI

#### 1. Heat Treatment Section

##### A) Efficiency and post efforts

Number of companies that benefited from CMDRI (2002-2004)	7
Number of newly benefited companies (2004-2007)	6
Number of recorded researches in 2005	6
Number of recorded researches in 2006	
Number of recorded researches in 2007	
Number of recorded services in 2005 (Projects, tests, evaluation,..)	7
Number of recorded services in 2006 (Projects, tests, evaluation,..)	7
Number of recorded services in 2007 (Projects, tests, evaluation,..)	3
Number of unaccepted services in 2005	0
Number of unaccepted services in 2006	0
Number of unaccepted services in 2007	0
Number of new contracts since 2004	0
Percentage of executed contracts	85
Percentage of ongoing contracts	15
Percentage of crippled contracts	0
Staying qualified workforce	2

##### B) Economic impacts

Impacts on benefited companies as follows:	
Increase in sales volume or market share (collective or individual)	
Increase production ( tones or number, new products)	
Increase in product price	
Increase in export figures (collective or individual)	
Decrease in imported materials (replacement by local products)	
Decrease in rejects	
Number of training programs (2004-2007)	4
Percentage of satisfied attendees	44
Percentage of unsatisfied attendees	0
Percentage increase in employment recorded by Eslia	
Percentage increase in employment recorded by Edcc	
Number of relevant privatized companies since 2004 Eslia	
Number of relevant privatized companies since 2004 Edcc	

##### C) Development

Number of newly adopted services/ tests since 2004	1
Number of newly developed associations since 2004	
Impact of training on employment (percentage general) in public sector	
Impact of training on employment (percentage general) in private sector	

**D) Equipment Availability**

Machine availability in 2005	66.7
Machine availability in 2006	75
Machine availability in 2007	80
Percentage of cost recovery	

**E) Financial analysis**

Adequacy of financial support ( percentage of covered costs)	
Government	
Service fees	
Grants	
Targeted budget for the coming 3 years (State Ministry of Scientific Research)	
Percentage of available planned sources during this period	

**2. High pressure Die Casting Section****A) Efficiency and post efforts**

Number of companies that benefited from CMDRI (2002-2004)	16
Number of newly benefited companies (2004-2007)	13
Number of recorded researches in 2005	2
Number of recorded researches in 2006	
Number of recorded researches in 2007	
Number of recorded services in 2005 (Projects, tests, evaluation,..)	8
Number of recorded services in 2006 (Projects, tests, evaluation,..)	24
Number of recorded services in 2007 (Projects, tests, evaluation,..)	52
Number of unaccepted services in 2005	
Number of unaccepted services in 2006	
Number of unaccepted services in 2007	
Number of new contracts since 2004	11
Percentage of executed contracts	50
Percentage of ongoing contracts	50
Percentage of crippled contracts	
Staying qualified workforce	1 of 3

**B) Economic impacts**

Impacts on benefited companies as follows:	
Increase in sales volume or market share (collective or individual)	
Increase production ( tones or number, new products)	
Increase in product price	
Increase in export figures (collective or individual)	
Decrease in imported materials (replacement by local products)	
Decrease in rejects	
Number of training programs (2004-2007)	17
Percentage of satisfied attendees	100
Percentage of unsatisfied attendees	
Percentage increase in employment recorded by Eslia	

Percentage increase in employment recorded by Edcc	
Number of relevant privatized companies since 2004 Eslia	
Number of relevant privatized companies since 2004 Edcc	

**C) Development**

Number of newly adopted services/ tests since 2004	
Number of newly developed associations since 2004	
Impact of training on employment (percentage general) in public sector	
Impact of training on employment (percentage general) in private sector	

**D) Equipment Availability**

Machine availability in 2005	80
Machine availability in 2006	70
Machine availability in 2007	60
Percentage of cost recovery	230

**E) Financial analysis**

Adequacy of financial support ( percentage of covered costs)	
Government	30
Service fees	70
Grants	
Targeted budget for the coming 3 years (State Ministry of Scientific Research)	
Percentage of available planned sources during this period	

**3. Laser Cutting Section****A) Efficiency and post efforts**

Number of companies that benefited from CMDRI (2002-2004)	8
Number of newly benefited companies (2004-2007)	
Number of recorded researches in 2005	2
Number of recorded researches in 2006	2
Number of recorded researches in 2007	
Number of recorded services in 2005 (Projects, tests, evaluation,..)	
Number of recorded services in 2006 (Projects, tests, evaluation,..)	
Number of recorded services in 2007 (Projects, tests, evaluation,..)	
Number of unaccepted services in 2005	
Number of unaccepted services in 2006	
Number of unaccepted services in 2007	
Number of new contracts since 2004	
Percentage of executed contracts	85
Percentage of ongoing contracts	15
Percentage of crippled contracts	
Staying qualified workforce	1

**B) Economic impacts**

Impacts on benefited companies as follows:	
Increase in sales volume or market share (collective or individual)	
Increase production ( tones or number, new products)	
Increase in product price	
Increase in export figures (collective or individual)	
Decrease in imported materials (replacement by local products)	
Decrease in rejects	
Number of training programs (2004-2007)	4
Percentage of satisfied attendees	25
Percentage of unsatisfied attendees	
Percentage increase in employment recorded by Eslia	
Percentage increase in employment recorded by Edcc	
Number of relevant privatized companies since 2004 Eslia	
Number of relevant privatized companies since 2004 Edcc	

**C) Development**

Number of newly adopted services/ tests since 2004	1
Number of newly developed associations since 2004	
Impact of training on employment (percentage general) in public sector	
Impact of training on employment (percentage general) in private sector	

**D) Equipment Availability**

Machine availability in 2005	100
Machine availability in 2006	94
Machine availability in 2007	80
Percentage of cost recovery	

**E) Financial analysis**

Adequacy of financial support ( percentage of covered costs)	
Government	
Service fees	
Grants	
Targeted budget for the coming 3 years (State Ministry of Scientific Research)	
Percentage of available planned sources during this period	

**4. Material Evaluation Section****A) Efficiency and post efforts**

Number of companies that benefited from CMDRI (2002-2004)	4
Number of newly benefited companies (2004-2007)	
Number of recorded researches in 2005	
Number of recorded researches in 2006	
Number of recorded researches in 2007	
Number of recorded services in 2005 (Projects, tests, evaluation,..)	
Number of recorded services in 2006 (Projects, tests, evaluation,..)	
Number of recorded services in 2007 (Projects, tests, evaluation,..)	



Number of unaccepted services in 2005	
Number of unaccepted services in 2006	
Number of unaccepted services in 2007	
Number of new contracts since 2004	
Percentage of executed contracts	100
Percentage of ongoing contracts	
Percentage of crippled contracts	
Staying qualified workforce	4 of 4

**B) Economic impacts**

Impacts on benefited companies as follows:	
Increase in sales volume or market share (collective or individual)	
Increase production ( tones or number, new products)	
Increase in product price	
Increase in export figures (collective or individual)	
Decrease in imported materials (replacement by local products)	
Decrease in rejects	
Number of training programs (2004-2007)	8
Percentage of satisfied attendees	
Percentage of unsatisfied attendees	
Percentage increase in employment recorded by Eslia	
Percentage increase in employment recorded by Edcc	
Number of relevant privatized companies since 2004 Eslia	
Number of relevant privatized companies since 2004 Edcc	

**C) Development**

Number of newly adopted services/ tests since 2004	1
Number of newly developed associations since 2004	
Impact of training on employment (percentage general) in public sector	
Impact of training on employment (percentage general) in private sector	

**D) Equipment Availability**

Machine availability in 2005	
Machine availability in 2006	
Machine availability in 2007	
Percentage of cost recovery	

**E) Financial analysis**

Adequacy of financial support ( percentage of covered costs)	
Government	
Service fees	
Grants	
Targeted budget for the coming 3 years (State Ministry of Scientific Research)	
Percentage of available planned sources during this period	

## 5. Cold Box and Shell Molding Section

### A) Efficiency and post efforts

Number of companies that benefited from CMDRI (2002-2004)	2
Number of newly benefited companies (2004-2007)	
Number of recorded researches in 2005	
Number of recorded researches in 2006	
Number of recorded researches in 2007	
Number of recorded services in 2005 (Projects, tests, evaluation,..)	
Number of recorded services in 2006 (Projects, tests, evaluation,..)	
Number of recorded services in 2007 (Projects, tests, evaluation,..)	
Number of unaccepted services in 2005	
Number of unaccepted services in 2006	
Number of unaccepted services in 2007	
Number of new contracts since 2004	
Percentage of executed contracts	100
Percentage of ongoing contracts	
Percentage of crippled contracts	
Staying qualified workforce	1

### B) Economic impacts

Impacts on benefited companies as follows:	
Increase in sales volume or market share (collective or individual)	
Increase production ( tones or number, new products)	1500 chain pieces increased to 2100 every month since 1/06
Increase in product price	
Increase in export figures (collective or individual)	
Decrease in imported materials (replacement by local products)	
Decrease in rejects	
Number of training programs (2004-2007)	2
Percentage of satisfied attendees	
Percentage of unsatisfied attendees	
Percentage increase in employment recorded by Eslia	
Percentage increase in employment recorded by Edcc	
Number of relevant privatized companies since 2004 Eslia	
Number of relevant privatized companies since 2004 Edcc	

**C) Development**

Number of newly adopted services/ tests since 2004	1
Number of newly developed associations since 2004	
Impact of training on employment (percentage general) in public sector	
Impact of training on employment (percentage general) in private sector	

**D) Equipment Availability**

Machine availability in 2005	
Machine availability in 2006	
Machine availability in 2007	
Percentage of cost recovery	

**E) Financial analysis**

Adequacy of financial support ( percentage of covered costs)	
Government	
Service fees	
Grants	
Targeted budget for the coming 3 years (State Ministry of Scientific Research)	
Percentage of available planned sources during this period	

## Annex 6.

## Findings from interviews and focus groups for CMRDI, ESLIA, and EDCC Companies

Date	Name	Findings
	<b>Dr. Abdel Moneim El Batahgy</b>	<b>Head of Manufacturing Technology Branch (Management Coordinator)</b>
	<b>Main duties</b>	Researches, Consultations, projects and product provision, training and material evaluation
	<b>1. Heat Treatment</b>	
14/1/2008	<b>a. Training and Seminars</b>	
	Sat 22, Wed 26 March 2003	36 participants ( one seminar)
	<b>b. Technical Services</b>	
	AOI – Factory 36	Engine Spares Carbonitriding
	Engine Factory	Engine Spares Solution treatment
	AOI – Factory 200	Sprocket pins Carburizing and hardening
	El Masrya for Resin	Crankshaft support ADI ( Austempered Ductile Iron)
	Glass Company	Gears and Dies Carburizing and Hardening
	El Hoda	Gears Carburizing
	Egyptian Granite Works	Cutting Tools Carburizing
		Total ( 7 services)
	<b>c. Researches</b>	
	Development of heat treatment processes	
	Effect of Carbon Distribution on Wear properties	
	Mathematical Modelling of Carbon Distribution	
	Welding ADI	
	Optimization of ADI process	
	Nitrocarborizing of ductile cast iron	
		6 researches

2. Material Evaluation		
6/1/2008	Dr. Khaled Ibrahim	Head of Mechanical Testing Section
		Capabilities include failure analysis
		New training course; material evaluation, avoiding product defectives and failures
		7-8 training programs to public and private sector companies (10 days)
		Major breakdowns are analysed and machines are sent to Japan for their high sophistication (only once)
		Calibration plan is in place (annual)
		Income is adequate for the services
		No data for employment
		There is preventive maintenance plan
		Researches are increasing
		No future needs plan
		10-12 report on average are daily collected (material evaluation)
		No clear evidence for company evaluation in the areas mentioned
		One test evaluation was performed for rebar steel export for EZDK to Saudi Arabia
		It is required to perform fatigue testing under high as well as low temperatures
		There exists case reports, but no analysis
		Service fees increase which reflects companies needs
		No accidents
		No emergency plan
		Awareness programs are held for marketing
		Fatigue tests are expensive which may cripple the continuation
	Ashraf Hassan	New Staff (Material Evaluation)
		The machine dealer is in Germany takes care of maintenance
		Services include post graduate studies and researches
		A file is established for each case
		CMRDI needs employees in this area
		CMRDI Mechanical Lab is ISO certified
		No real new associations

3. Laser Cutting		
14/1/2008	<b>a. Training</b>	
	Training course 2005 (cutting and welding) 5 participants	1
	2006 (18 participants)	2
	2007 (2 participants)	1
	<b>b. maintenance</b>	
	utilization hrs 2002-2004	700/3= 233 average
	2005	200
	2006	190
	2007	220
	Available working hours	Based on 50 weeks , 40 hours a week = 2000 hrs /year
	Breakdown 2004 (hrs)	600
	2005	0
	2006	120
	2007	400
	(Lack of spares)	
	Availability	
	2004	70
	2005	100
	2006	94
	2007	80
	Service fees	8-12 LE / hr = 80 LE/day
		No planned resources
		Targeted budget (not settled)
	<b>c. services</b>	
	Laser cutting 2005 link Misr	
	Tiba for metal manufacture 2006	
	Feeding Industry (Industrial Control) 2006	
	Egyptian-Swiss for precision works 2007	
	<b>d. Researches</b>	
	Laser beam cutting	Al Azhar University
	Laser beam cutting	Helwan University
	Laser beam cutting	El Fayoum
	Laser Surface Hardening	Cairo University

	<b>4. High pressure Die Casting</b>	
6/1/2008	Dr. Mohamed Waly	Head of Foundry Technology Lab
	Eng. Raafat Abdel Raheem	Foundry Technology Lab
	<b>a. Services</b>	Die Casting Project 10 major companies made use of the project as well as others (documents to be prepared) New casting products and control of casting conditions Treatment of stamp to improve its efficiency and service life Knowledge of some techniques in foundry for aluminum pipe, semi solid casting
		No export figures available for the benefited companies
		Impact : reduce production cost, improve quality, reduce rejects (evidence needed)
		Training service is paid (e.g. Toshiba) .(Records needed)
		Staff qualification: 3 were trained, 1 left to Ezz Group
		No breakdown analysis was made for the equipment. Generally no major breaks
		No financial support after the project termination
		The income from the equipment covers training, trouble shooting and production costs (no documents)
		No other financial support for maintenance and repair except from fees
		Fees are almost adequate
		No increase in employment in CMRDI as direct impact from the project
		No unacceptable service
		No stats for machine troubles
		Associations are not effectively established in that producers do not want to reveal product information
		Services are: Training, Product provision and Consultation
		The Budget for future needs is enough (not evidenced)
		No complaints received from the benefited companies
		Needed additional equipment; Melting Furnace for Copper Alloy. The governmental budget for the fiscal year 2007-2008 is not approved

4. High pressure Die Casting		
		Communication is through e-mail, telephones, conferences, meetings, personal contacts, free workshops, visits
		No data analysis ( cases categorization, services provided, training programs, ..)
		Awareness program for technicians, engineers are in place
		No evaluation for the training programs Short programs: 2-3 days Long programs : 1 – 1 1/2 months
		There is no unfulfilled activity
		There is no economic factors that may hinder the continuation of the project, even without governmental support
		No feedback figures from the benefited companies
		No planning for future needs in contradiction to the presented budget 2007-2008 for approval
		Associations such as ESLIA, EDCC were just proposed during the project, but were never established
		No systematic records were available
	Eng. Walid Syam	(Trained in Japan ) on maintenance and repair of dies for automatic foundry
		The machine has automatic trouble shooting diagnosis through built in software It tells the error and the way to remove
		No traceability for: Factors that affect the final result of product Material cost Cost of used oils
		Part of income is used for maintenance activities
		The service fees are the only financial support to cover repair and maintenance requirements



<b>4. High pressure Die Casting</b>		
Eng. Sayed Abdel Tawab	New Staff Qualified through on the job training	
	The Egyptian Company for Metals increased their castings from 1 to 6 products	
	No operation or maintenance problem. Some clients provide the necessary oil and grease	
	(No figures provided for the number of training programs)	
	New employees do not obtain formal training programs, only on the job but no evaluation	
	Activities are recorded	
High Pressure Die Casting daily , weekly, quarterly and monthly check log plan for 2007 and 2008		
Future targets from technology transfer		
Higher productivity	No evidence provided	
Better surface finish	No evidence provided	
Replacing metal die technology to reduce costs	No evidence provided	
Increase the diversity of produced parts	No evidence provided	
Help SMEs by high quality sand cores	No evidence provided	
<b>a. Training 2004</b>		
EDCC 2004	3 courses	
Toshiba 2003-2004	Engineers ( 2days a week)	
Graduates ( 1 month approx) 2004	4	
2005	4	
2006	6	

<b>5. Cold box and Shell molding machines</b>		
8/1/2008	Higher productivity	No evidence provided
	Better surface finish	No evidence provided
	Replacing metal die technology to reduce costs	No evidence provided
	Increase the diversity of produced parts	No evidence provided
	Help SMEs by high quality sand cores	No evidence provided
	<b>a. Services</b>	
	Cold box sand testing	
	Mansoura Co. for resins	No evidence the service is provided
	Cold Box Machine maintenance Plan for the year 2007	Only visual checking, no clue for hydraulic oil regular testing and change, adjustment if necessary,. .etc
	ESLIA members	17
	EDCC members	40

## Findings from interviews and focus groups for Member Companies (SMEs)

	<b>ESLIA</b>	<b>Cairo University, Laser Canter</b>
21/1/2008	Prof. Dr. Adel Abdel Azeem	President of ESLIA Association
21/1/2008	Eng. Ramadan M. Ramadan	Egyptian Iron and Steel Company
21/1/2008	Eng. Ezz Eldeen Sorour	Research and Development, GMC Co. for Home Appliances
21/1/2008	Eng. Abdel Rahman Abu Zeid	MOG Group
21/1/2008	Eng. Mostafa Sharara	MOG Group
21/1/2008	Eng. Wafaa Abbas	Post Graduate Candidate
		GMC is 40% market share
		MOG made 40% cost cutting
		MOG has a Laser Machine
		They earn 10 LE/min from 3 LE/min of cutting
	<b>EDCC</b>	
	<b>Three Brothers Company</b>	<b>10<sup>th</sup> of Ramadan</b>
29/1/2008	Eng. Alber Sadek Fahry	Vice Chairman
	Mr. Mina Maher	Production Section Supervisor, Three Brothers
	Eng. Seliman Naguib	Factory Manager, Three Brothers
	Eng. Tharwat Hosny	Die Casting Supervisor, Three Brothers
		Solution for alloys such as silicone 12, consultations with CMRDI
		Removal of Magnesium from alloys, solution of deformation problems, Welding Machine adjustment
		Reduction of reject by 25 – 40%
		No export, only local
		No effect on employment, only improve quality of the product

	<b>Egyptian International Company for Metal Technology, 10<sup>th</sup> of Ramadan (small enterprise)</b>	<b>10<sup>th</sup> of Ramadan</b>
29/1/2008	Eng. Yasser Nazim	Company Owner
		They don't have the Die Casting machine, they buy the service of CMRDI to manufacture stamps
		Three training courses 2004, 2005 on Design and Casting
		Customer increases from 1 to 6 after working with CMRDI
		Products increase from 3 stamps to 6 and eventually 14 different stamps in 2007
		CMRDI is characterized by high quality and ethics
		Drawbacks include:
		Bureaucracy and delivery times
		No adequate marketing for their training programs or services
		Very small research budget
		CMRDI do not solicit foreign trainers
		Die Casting capacity is 250 tons, it is required to increase it to 400 tons to fulfill the market required by our company
		Rejects is only 1-2% and normally they are reworked
		Market share increased from 3.33 % to almost 20% in 2007
		Employment increased from 6 to 20 technicians
		No machine to manufacture Zinc with Titanium
		No real technical support from Cold Box Technology.
		The Machine was out of order for more than 6 months because of spare parts lack

	<b>Emco for Metal Industries</b>	<b>El Obour</b>
29/1/2008	Eng. Yasser Abul Kassim Taha	EL Obour Factory Manager, Emco for Metal Industries
		They have a Die Casting Machine 1600, Aluminum Casting which requires stamps
		Support in Street Light Reflectors and Heat Treatment
		Direct impact is the increase in number of stamps from 10,000 to 100,000 injections
		Cracks are observed after 10,000 injections which produce low quality products as well as maintenance works and delays
		Direct impact of training include:
		Reduction of Stamp production time
		Reduction of delays
		Reduction of costs
		No change in employment

**Annex 7****List of interviewed Participants from CMDRI**

<b>Date</b>	<b>Name</b>	<b>Function</b>
6/1/2008	Dr. Abdel Moneim El Batahgy	Head of Manufacturing Technology Branch
6/1/2008	Dr. Mohamed Wally	Die casting Manager.
6/1/2008	Dr. Khaled Ebrahim	Material Evaluation Manager.
6/1/2008	Eng. Walid Syam	Die casting, trainee in Japan
6/1/2008	Eng. Ayman Hamada	Material Evaluation, trainee in Japan
6/1/2008	Eng. Ashraf Hassan	Material Evaluation new staff
6/1/2008	Eng. Mahmoud Hassan	Material Evaluation new staff
6/1/2008	Eng. Sayed Abdel Tawab	Die Casting new staff
8/1/2008	Eng. Raafat Abdel Reheem	Cold box Manager, trainee in Japan.
14/1/2008	Dr. Taher Ahmed El Bitar	Heat Treatment Manager.
14/1/2008	Dr. Khaled Abdel Ghany	Laser technology Manager.
14/1/2008	Eng. Mohamed Abdul Mawgood	Heat Treatment new staff in Egypt.
14/1/2008	Eng. Mohamed Heshmat	Heat Treatment new staff

**List of interviewed Participants from ESLIA, EDCC member companies**

<b>Date</b>	<b>Name</b>	<b>Function</b>
21/1/2008	Prof. Dr. Adel Abdel Azeem	President of ESLIA Association
21/1/2008	Eng. Ramadan M. Ramadan	Egyptian Iron and Steel Company ESLIA
21/1/2008	Eng. Ezz Eldeen Sorour	Research and Development, GMC Co. for Home Appliances ESLIA
21/1/2008	Eng. Abdel Rahman Abu Zeid	MOG Group ESLIA
21/1/2008	Eng. Mostafa Sharara	MOG Group ESLIA
21/1/2008	Eng. Wafaa Abbas	Post Graduate Candidate ESLIA
29/1/2008	Eng. Alber Sdek Fakhry	Vice Chairman, Three Brothers Co., 10 <sup>th</sup> of Ramadan EDCC
29/1/2008	Mr. Mina Maher	Production Section Supervisor, Three Brothers EDCC
29/1/2008	Eng. Seliman Naguib	Factory Manager, Three Brothers EDCC
29/1/2008	Eng. Tharwat Hosny	Die Casting Supervisor, Three Brothers EDCC
29/1/2008	Eng. Yasser Nazim	Company Owner, Egyptian International Company for Metal Technology, 10 <sup>th</sup> of Ramadan (small enterprise) EDCC
29/1/2008	Eng. Yasser Abul Kassim	EL Obour Factory Manager, Emco for Metal Industries EDCC

## Annex 8

### Basic Data Requirements from the different Parties

#### **In-Depth Interviews**

##### ***Managers CMRDI***

- 1-Basic Information about benefited companies and Associations (numbers, services, cases, projects ...)
- 2- Strategic ( Targets and future plans, financial support, budget, organizational, employment ..)
- 3- Technical (Equipment availability, Testing instruments, ..)
- 4- Development (Training, trends, new technologies, educational resources,..)
- 5- Quality and Management Systems (Environmental, Safety,..)

##### ***Counterparts trained in Japan***

- 1- Contribution to service and training
- 2- Equipment using and maintenance
- 3- Control and Traceability of non-conforming services
- 4- Feedback analysis for inhibiting factors
- 5- Involvement and improvement programs
- 6- Case categorization and analysis

##### ***New Staff in CMRDI***

- 1- Newly hired induction and qualification programs
- 2- Number as a reflection of employment (capacity)
- 3- Number as a reflection of newly adopted techniques and services range
- 4- New training programs ( training resources )
- 6- Involvement and improvement programs

##### ***ESLIA, EDCC Associations***

- 1- Data on services and training provided by CMRDI including researches ( Number, types, evaluation,..)
- 2- Impact of new technologies
- 3- Impact of CMRDI objectives and targets on member companies
- 4- Data on member companies (number, size, type,..)
- 5- Data on Export and local market share (impact of competency building and services provided)
- 6- Impact on privatized companies (number, development,..)
- 7- Contract progress of member companies
- 8- Employment trend
- 9- Status of newly developed associations
- 10- Contribution to sustain the project (financial, facilities, human resources,..)

***Officers from Ministry of Scientific Research***

- 1- Strategy as to utilize CMRDI and future plans (Mission, Objective and Targets, plans for researches and pilot projects,..)
- 2- Future needs analysis for CMRDI (organizational, facilities, ..)
- 3- Financial Support and budgeting for sustainability
- 4- Expected impacts from CMRDI on the relevant industries
- 5- Association development ( Number, types, size, planned objectives, new associations, ..)
- 6- Employment trend analysis
- 7- Impact of new technologies and training on the competencies of the relevant industries  
e.g. quality, market share and economic value(figures..)
- 8- Analysis of factors that affects the outcomes of CMRDI
- 9- Feedback analysis from companies and associations
- 10- Privatized companies (Number, types, size, competencies and economic values,..)

***Officers from Ministry of Trade and Industry***

- 1- Data on the progress of companies in the relevant industries which utilized the services, researches, and training of CMRDI (number, size, type,..)
- 2- Data on Export and local market share (impact of competency building and services provided)
- 3- Impact on privatized companies ( number, development,..)
- 4- Contract progress of member companies
- 5- Employment trend
- 6- Impact of new technologies and training on the competencies of the relevant industries  
e.g. quality, market share and economic value(figures..)
- 7- Feedback evaluation from the benefited companies
- 8- Current and future targets in coordination with the Ministry of Scientific Research
- 9- Analysis of factors that affect the intended outcomes from  
CMRDI



**Focus Group**

***Staff in CMRDI***

- 1- Data on the companies and services provided including researches and piloting
- 2- Impact on the competencies of benefited companies
- 3- Training programs and analysis (companies)
- 4- Contract progress with the different companies
- 5- Availability of equipment and testing device
- 6- Root cause analysis and corrective/preventive actions
- 7- Financial support analysis for operations and maintenance
- 8- Employment trend feedback
- 9- Control of non-conforming services
- 10- New technologies, training programs and lab tests added to CMDRI
- 11- Impact of services on companies competencies
- 12- Current and future needs (to fulfill objectives and targets,..)
- 13- Companies feedback evaluation on the services provided by CMRDI
- 14- Environment and Safety systems
- 15- Communication means (internal, external,..)
- 16- Factors affecting the intended outcomes of CMRDI
- 15- Training programs and analysis (CMRDI Staff)

***Engineers/Senior Technicians***

- 1- New services provided by CMDRI
- 2- Breakdown analysis of equipment and testing devices / Root cause
- 3- Non-conforming service traceability and response to companies complaints
- 4- Technical factors that affects the intended outcomes from CMRDI
- 5- Equipment maintenance plans / implementation (availability)
- 6- Testing device maintenance and calibration plans
- 7- Training programs and trainers qualifications
- 8- Research test results documentation
- 9- Case data categorization / Analysis
- 10- Environmental impact assessment and plans
- 11- Operations risk assessment and plans

***Engineers, Operators and Technicians trained at CMRDI and work in Public and Private Sectors***

- 1- Companies new capabilities acquired from the services provided by CMRDI
- 2- Training evaluation of new technologies by the trainees
- 3- Progress of contracts and agreements with CMRDI
- 4- Employment trend in the companies
- 5- Impact of new technologies (new products, values,..)

- 6- Factors that affect the intended outcomes from CMRDI
- 7- Types of technical support by CMRDI after training, implementation, piloting,...
- 8- Feedback evaluation of the technical services provided by the project
- 9- Safety awareness programs delivered

***Technicians in Maintenance***

- 1- Maintenance plans/execution
- 2- Trouble shoot analysis of equipment and testing devices
- 3- Corrective and preventive actions
- 4- Contribution to training on new technologies (maintenance implications)
- 5- Factors affecting the proper maintenance and repair of equipment and testing devices
- 6- Calibration plans
- 7- Risk assessment and Safety awareness

***Undergraduate Trainees (if any)***

- 1- Number and types of training programs and relevance
- 2- Training program evaluation

**Records**

All relevant documents that evidence all the above requirements

**Questionnaires**

Form 1 for following groups:

- Representatives from ESLIA, EDCC (10% of the members)

Form 2 for the following groups

- Group of Trainees
- Engineers from CMRDI (10%)
- Operators from CMRDI (10%)
- Maintenance technicians CMRDI (10%)

**Annex 9****Visit tasks for the period from 20/12/2007 to 29/1/2008**

<b>Visits #</b>	<b>Visits Dates</b>	<b>Place</b>	<b>Visits Target and Particulars</b>
1	Thu 20/12/2007	CMRDI, Helwan, Cairo	Preparation visit, requirements agreement and project tour
2	Sun 6/01/2008	CMRDI, Helwan, Cairo	Die casting & Material Evaluation IDI
3	Tue 8/01/2008	CMRDI, Helwan, Cairo	Cold Box IDI
4	Mon 4/01/2008	CMRDI, Helwan, Cairo	Heat Treatment & laser technology IDI
5	Wed 6/01/2008	CMRDI, Helwan, Cairo	Records checking and Data completion
6	Thu 17/01/2008	CMRDI, Helwan, Cairo	Data completion and collection from project managers.
7	Mon 21/01/2008	Cairo University, Laser Center	ESLIA company members meeting , FGD, IDI
8	Tue 29/01/2008	El Obour, 10 <sup>th</sup> of Ramadan	EDCC, SMEs (small and medium enterprises), FGD, IDI

## Annex 10: Project Design Matrix (PDM)

Project on Upgrading of Metal Processing Technology in the Arab Republic of Egypt

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
<p>Overall Goal</p> <p>Technical capability for production of metal processing industries in Egypt is upgraded.</p>	<p>1 Increase of products delivered to industries</p> <p>2 Improvement of quality of products</p> <p>3 Improvement of productivity and efficiency</p>	<p>1-1 Industrial Statistics</p> <p>1-2 Survey Report</p> <p>2 Survey Report</p> <p>3 Survey Report</p>	<p>a There is no drastic change in political and economic situation in Egypt.</p> <p>b Metal processing industries development policy remain unchanged.</p>
<p>Project Purpose</p> <p>Technical services for metal processing industries extended by CMRDI are upgraded.</p>	<p>1 Level of satisfaction of service beneficiaries</p> <p>2 Variety of technical services extended by CMRDI</p>	<p>1 Questionnaire to and interview with beneficiaries</p> <p>2 Activity reports</p>	<p>a Egyptian metal processing industries utilize the technology obtained from CMRDI.</p>
<p>Outputs</p> <p>0 Project operation unit is enhanced.</p> <p>1 Necessary machinery and equipment are provided, installed, operated and maintained properly.</p> <p>2 Technical capability of the counterpart personnel (hereinafter referred to as "C/P") is upgraded.</p> <p>3 Technical services for metal processing industries are provided.</p>	<p>0 Number and capability of staff, budget and established management system</p> <p>1-1 Contents and condition of machinery and equipment</p> <p>1-2 Route to get spare parts and situation of securing spare parts</p> <p>2-1 Assessment by the Japanese experts</p> <p>2-2 Training materials for the C/P</p> <p>3-1 Level of the technical services provided for metal processing industries</p> <p>(1) Number of technical services implemented</p> <p>(2) Number of technical services recipients</p> <p>(3) Number of document, curricula, manuals and materials for technical services</p> <p>3-2 Assessment by beneficiaries</p>	<p>0 Organization chart, Administration record, Accounting record, Personnel record</p> <p>1-1 Property record, operation and maintenance record of machinery and equipment</p> <p>1-2 Spare parts list, suppliers list</p> <p>2-1 (1) Evaluation Sheet in general (2) Evaluation sheet for target products</p> <p>2-2 (1) Questionnaire to the C/P (2) Interview with the C/P</p> <p>3-1 Evaluation sheet</p> <p>(1) List of technical services implemented</p> <p>(2) List of technical services recipients</p> <p>(3) List of curricula, manuals and materials for technical services</p> <p>3-2 Questionnaire to and interview with beneficiaries</p>	<p>a Trained C/P remain at CMRDI.</p>
<p>Activities</p> <p>0-1 Allocate necessary personnel.</p> <p>0-2 Formulate plans of activities.</p> <p>0-3 Make budget plan and execute properly.</p> <p>0-4 Establish and operate management system.</p> <p>1-1 Make facility refurbishment plan and implement as planned.</p> <p>1-2 Provide and install necessary machinery and equipment.</p> <p>1-3 Operate and maintain machinery and equipment properly.</p> <p>2-1 Make Technical Cooperation Program.</p> <p>2-2 Implement technology transfer to the C/P.</p> <p>2-3 Monitor and evaluate the result of the technology transfer to the C/P.</p> <p>3-1 Make plan of technical services.</p> <p>3-2 Implement technical services.</p> <p>3-3 Monitor and evaluate technical services.</p>	<p style="text-align: center;">Inputs</p> <p style="text-align: center;">&lt;Egyptian side&gt;</p> <p>1 Provision and maintenance of building and facilities</p> <p>2 Allocation of the C/P and administrative personnel</p> <p>(1) Management C/P</p> <p>(2) Technical C/P</p> <p>(3) Supporting staff</p> <p>3 Provision of machinery, equipment and their maintenance</p> <p>4 Local Cost</p> <p>Necessary budget for the implementation of the Project</p>	<p style="text-align: center;">&lt;Japanese side&gt;</p> <p>1 Dispatch of Japanese Experts</p> <p>(1) Long term Experts</p> <p>a Chief Advisor</p> <p>b Project Coordinator</p> <p>c Control of Mechanical Properties and Quality Control</p> <p>d Aluminium High Pressure Die Casting</p> <p>e Laser Cutting</p> <p>(2) Short Term Experts</p> <p>Appropriate number of short term experts will be dispatched as necessity arises.</p> <p>2 Egyptian C/P training in Japan a certain number (maximum 3 persons) of the C/P yearly</p> <p>3 Provision of Machinery and Equipment</p> <p>4 Supporting Local Cost</p>	<p>a The C/P remain at CMRDI.</p> <p>Preconditions</p> <p>Renovation of the Project site is stably provided</p>

(Remarks) Outputs 3 will be applied to the fields of Aluminium High Pressure Die Casting and Laser Cutting.

事後評価調査結果要約表

評価実施部署：エジプト事務所

1. 案件の概要	
国名：エジプト	案件名：金属加工技術向上プロジェクト
分野：産業/一般	協力形態：プロジェクト方式技術協力（現：技術協力プロジェクト）
所轄部署：エジプト事務所	協力金額：9.3 億円
協力期間	2000 年 10 月から 2004 年 9 月
	先方関係機関：中央冶金研究所（Central Metallurgical Research and Development Institute; CMRDI） 日本側協力機関：R/D 締結時の名称（現名称）
他の関連協力：シニアボランティア（指導科目：プラントメンテナンス、派遣期間：2006 年 3 月から 2008 年 3 月）	
<p>1-1 協力の背景と概要</p> <p>エジプトは 1991 年以来、継続的に国家統制経済から自由市場化へ移行し、財政の安定と高い GDP 成長率を達成した。また、慢性的な貿易赤字の解消を視野に入れ、輸出産業への投資促進策がとられており、国営企業の段階的な民営化による産業の活性化が進められた。しかし、多くの企業はそれまでの保護政策下で十分な国際競争力を身につけていない状況にあった。同国の基幹である組み立て工業に必要な部品や資材を提供する裾野産業は依然として基本的な技術や品質管理手法が不十分であり、産業の競争力強化を阻害する要因となっていることから、その早急な改善が必要な状況であった。</p> <p>WTO 規制の施行に鑑みても、エジプト企業は生産性を向上し、市場の自由化と関税による保護の緩和に適応しなければならないため、エジプト政府は産業近代化プログラム（Industrial Modernization Program: IMP）を EU 他との共同で実施することを決定した。IMP では、エンジニアリング産業が最重要産業のひとつとされた。また、技術コンサルティングによる支援は、IMP の主要な 5 つの要素のひとつに挙げられている。このような状況下、エジプトにおける金属研究開発および民間企業への技術サービス提供において中核的な役割を担う政府組織である中央冶金研究所（Central Metallurgical Research and Development Institute: CMRDI）は上述の政策の実施において重要な役割を担うことを期待されている。なお、CMRDI は科学研究省傘下の国立研究機関である。</p> <p>エジプト政府は、金属加工産業に対して CMRDI が行う技術向上の拡大を促すため、技術支援を日本政府に要請した。これを受けて日本政府は 2000 年 10 月から 2004 年 9 月までの協力期間で、CMRDI の金属加工技術サービスの向上に向けた技術協力プロジェクトである、「金属加工技術向上プロジェクト」（以下、「プロジェクト」）を実施した。技術移転を実施した分野は大別して、熱処理、アルミダイキャストリング、レーザ切断、材質制御/品質管理、コールドボックス/シェルモールドディング、の 5 分野であった。</p> <p>プロジェクト終了時評価は 2004 年 9 月に実施され、効率性に関し多くの阻害要因があったもののプロジェクトは成功裡に実施されたことと、プロジェクト成功に貢献した要因のうち、モチベーションの高いカウンターパートと日本人専門家によるコミットメントが非常に重要であったこと等の指摘がなされた。</p> <p>プロジェクト協力期間 3 年を経過したため、協力後のインパクトおよび自立発展性を主に確認するため、JICA エジプト事務所がエジプトのコンサルティング会社と契約し、事後評価調査を実施した。</p>	

1-2 協力内容

(1) 上位目標

エジプトの金属加工産業の製造技術能力が向上する。

(2) プロジェクト目標

CMRDI が金属加工企業に対して実施する技術サービスの質が向上する。

(3) アウトプット (成果)

ア. 運営体制が整備される。

イ. 必要な資機材が整備され、適切に管理される。

ウ. カウンターパートの技術力が向上する。

エ. CMRDI が金属加工企業に対し、技術サービスを提供する。

(4) 投入 (プロジェクト終了時)

日本側：

長期専門家派遣	47名	機材供与	3.8億円
短期専門家派遣	6名	ローカルコスト負担	0.27億円
研修員受入	11名		

総額 9.3億円

相手国側：(2004年9月時点：1LE=約30円)

カウンターパート配置	20名	土地・施設提供
ローカルコスト負担	925,000L.E.	0.28億円

総額 0.28億円

2. 評価調査団の概要

調査者	JICA エジプト事務所 El-Zanaty & Associates Co. (ローカルコンサルタント会社)	
調査期間	2007年12月9日～2008年2月1日	評価種類：事後評価

3. 実績の確認

3-1 プロジェクト目標の状況

プロジェクトが技術支援をした5分野(熱処理、アルミダイキャスティング、レーザ切断、材質制御/品質管理、コールドボックス/シェルモールドイング)において、CMRDI が金属加工産業界へ提供する技術支援サービスの質は向上している。複数の企業、特に、小規模企業が CMRDI の技術支援サービスを役立てている。研修機会の提供、および企業からの試作品受注サービス提供に関しては、レーザ切断、ダイキャスティング、および熱処理(特に、ダクタイル鋳鉄のオーステンパー処理)分野で活発に活動が続いている。プロジェクト終了時には顧客企業が37であったが、現在19社が新たに加わり、計56社に対しCMRDI はサービスを提供している。プロジェクト終了後にCMRDI が行ったサービスは113種であった。この中には、研究、プロジェクト、およびテスト・評価が含まれる。アルミダイキャスティング以外の4分野において、CMRDI はプロジェクト終了後、新技術を適用したサービスを行っている。6社に対して行った In-depth インタビューによると、CMRDI の支援をきっかけに新技術を導入し収益を増やした会社や、欠陥品の削減、生産量の増、生産コスト・時間の削減が見られた企業があった。ダイキャスティング分野の支援を受けたある小企業は国内市場占有率を3.3%から約20%へと大きく伸張したとインタビューに回答した。CMRDI の支援を受けた企業は、輸出面では目立った変化がなかったものの、国内市場での生産に関し、正のインパクトが認められた。CMRDI が技術支援を行った企業で雇用の増加傾向が見られたのは、In-depth インタビューに協力した6社のうち、比較的小規模企業の1社のみであった。

3-2 上位目標の達成状況

本プロジェクトのエジプト産業界全体に対する貢献度を示すレポートやデータを収集することが困難だったため、上位目標の達成状況を測ることは難しい。CMRDI や ESLIA (エジプト工業用レーザ協会、Egyptian

Society of Laser Industrial Application)、EDCC (エジプトダイキャスト協会、Egyptian Die Casting Chapter) で入手できる記録には、例えば、裨益者のマーケットシェア、生産コストや生産性の変化といった統計がなく、裨益者の観点からの本件プロジェクトのインパクトを明らかにできなかった。したがって、本評価調査チームは In-depth インタビューや CMRDI の職員とのフォーカスグループディスカッションを行ってプロジェクトのインパクトを掴むことを試みたが、その結果はむしろ3-1のプロジェクト目標の達成状況にあてはまるため、そちらに記載した。上位目標の達成状況を図るための指標とその入手手段は、終了時評価もしくはその前の段階でより精査されることが望ましい。

### 3-3 終了時評価での提言の活用状況

#### (1) 定期的メンテナンス

提言：CMRDI は機材の定期的なメンテナンスと運転テストを行うべきである。

現状：CMRDI は定期的なメンテナンスと運転テストを行っている。

#### (2) メンテナンスの記録

提言：機械の故障等に備えて、CMRDI は職員がメンテナンスの記録をつけるべきである。

現状：CMRDI からはメンテナンス計画と記録を持っていると説明があったが、故障やその原因分析の記録は CMRDI から提出されなかったため存在の確認は出来なかった。

#### (3) 外部機関とのコミュニケーション

提言：CMRDI は顧客の高度になっていく需要に応える技術サービスを提供するために、外部の技術関連機関とのコミュニケーションを取り続けるべきである。

現状：CMRDI は外部機関とのコミュニケーションおよび技術サービスの宣伝がまだ不足気味である。

#### (4) 教材の改善

提言：CMRDI は顧客の高度になっていく需要に応える技術サービスを提供するために、教材を改善し続けるべきである。

現状：CMRDI は自力で教材を改善し続けているものの、外国専門家の支援が必要な場合もある。

#### (5) ケースデータの分類と分析

提言：CMRDI は各技術サービスを通じて得られる具体的なデータを体系的に分類・蓄積して、CMRDI 内の経験の浅い職員が活用できるようにするべきである。

現状：CMRDI から体系的に分析・蓄積している証拠の提示がなされなかったため、該当データの存在を確認できなかった。

#### (6) 新しい要素技術協会の設立

提言：CMRDI は企業や研究者に金属加工技術に関する情報を提供するための基盤として、新しい技術協会を設立するイニシアチブを執り続けるべきである。

現状：プロジェクト期間中に設立された2組織 (ESLIA および EDCC) 以外には新組織は設立されていない。また、同2組織も、メンバー企業のリストやデータベース等が整備されておらず、技術面でも活動は現在あまり活発とは言い切れない。また、同2組織ではメンバー企業の経済活動動向も把握していない。

#### (7) 安全対策

提言：CMRDI は所内で安全対策を講じ続け、職員に安全対策の周知徹底を行うべきである。

現状：CMRDI の一般的な業務では通常要求される安全対策が日常的に行われている。

#### (8) 環境配慮

提言：CMRDI は環境に配慮して業務を行うべきである。

現状：CMRDI の一般的な業務では最低限の環境配慮がなされている。しかし各業務でより詳細な評価が必要である。

## 4. 評価結果の概要

### 4-1 評価結果の要約

#### (1) インパクト

プロジェクト期間終了後、CMRDI はサービスを向上する努力を行い、プロジェクト終了時の 37 社から現在は 56 社へと顧客企業を増やしてきた。サービスを受けた企業が引き続き支援を受けていることから、企業の満足度が高いことがわかる。また、CMRDI が支援した企業において、新技術適用による増収、欠陥品の減少、生産性の向上等の正のインパクトが見られた。ただし、CMRDI のサービスを受けた企業において輸出関連の正のインパクトを示すデータは得られなかった。CMRDI が支援した社における雇用の増は、調査に協力した 6 社のうちの 1 社でのみ認められた。また、CMRDI はダイキャスト分野以外の 4 分野で各 1 種の新サービスを開発した。コールドボックス技術を活用した企業は 2 社のみであった。ただし、上位目標がどこまで満たされたか、それにプロジェクトがどこまで貢献したかを数値で評価することはできなかった。プロジェクトの PDM の指標と入手手段の設定により工夫が必要である。

#### (2) 自立発展性

財政的には、CMRDI は予算の 30% を政府から得ている。その他の 70% は CMRDI が企業へ提供するサービスの料金で支弁している。財政面においては、自立発展性に問題はない。

組織的には、CMRDI は増員の努力を続けている。カウンターパート研修員として日本で研修を受けた 11 名のうち、2 名は退職したものの、引き続き 9 名がプロジェクトの成果の発現に努めており、新規に 5 名が採用され、エジプト国内で研修を受けた。ただし、材質評価/品質管理分野では、一層の増員が必要である。3 年から 5 年の中期計画が CMRDI から提示されなかったため、組織としての戦略・方向性は確認できなかった。よって、人員はほぼ問題なく増強されているものの、組織面での自立発展性が十分とは言い切れない。

技術的には、機材が必要なときに使用可能な状態になっていることから、自立発展性があると言える。

### 4-2 プロジェクトの促進要因

#### (1) インパクト発現を促進した要因

ダクティル鋳鉄のオーステンパー処理やレーザ切断といった要素技術に対する市場のニーズが高かったことによって、CMRDI からの技術支援件数が増加した。

技術支援によって企業の欠陥品が減少するという目に見える成果があったため、技術移転が促進された。

#### (2) 自立発展性強化を促進した要因

財政面で CMRDI の運営に問題がなかったことは自立発展性を促進した。

CMRDI が提供する技術支援に対して企業が支払う料金収入が適切に設定されているため、CMRDI の生産コスト、人件費、および維持管理費を支弁できている。

機材が必要時に使用できる状態にあった。

機材の維持管理計画（月毎および週毎）は入手可能であり、また、その計画が実行されていた。

#### (3) その他の促進要因

なし



#### 4-3 プロジェクトの阻害要因

##### (1) インパクト発現を阻害した要因

企業にとっては機材の故障解析法 (Failure Analysis) の分析コストがかさむため、同分析方法のノウハウは CMRDI に存在しているものの、CMRDI と企業で行う研究活動にのみ活用されており、企業の生産活動そのものへの技術支援には活用されなかった。

CMRDI の企業に対する技術支援のマーケティングが不足している。よって、企業が CMRDI の実施している技術支援の内容や実施時期を認識しておらず、CMRDI は顧客を増やす機会を活かしきれていない。

ダイキャスト分野等については、市場のニーズがあるにもかかわらず研究費用が不足しており、増額する必要がある。また、同分野では特に、技術を向上させるための外国人講師による支援が必要である。

##### (2) 自立発展性強化を阻害した要因

機材の故障解析法は上述のとおり研究のみに活用されており、企業の生産活動への技術支援においては活用されていないが、本手法の指導を企業の生産活動への技術支援に組み込めばその料金収入でより財政が安定する。

溶接継手の疲労試験も費用がかさむため企業が活用しておらず、そのため CMRDI での技術力維持に不安がある。

CMRDI は材質評価/品質管理分野で人員が不足している。

##### (3) その他の阻害要因

なし

#### 4-4 結論

上位目標がどこまで満たされたか、それにプロジェクトがどこまで貢献したかを明確に数値で評価することはできなかったが、正のインパクトが認められている。プロジェクト協力期間終了後、CMRDI は 113 の支援および 35 コースの研修を実施した。また、協力期間中に CMRDI が技術支援サービスを行った企業数は 37 社であったが、協力期間終了後、現在までの期間に、同 37 社への継続支援に加え、新規の 19 社への支援を行っており、顧客数は現在 57 社に達している。CMRDI の支援を受けた企業には、増収、欠陥品の減少、生産量の増加、生産コスト・生産時間の減少、国内市場占有率の伸張といった効果が出ている。CMRDI の支援を受けた企業は、輸出面では目立った変化がなかったものの、国内市場での生産に関し、正のインパクトが認められた。一方、CMRDI が技術支援を行った企業で雇用の増加傾向が見られたのは、本調査 (In-Depth Interview) に協力した 6 社のうち、比較的小規模企業の 1 社のみであった。なお、評価チームは本評価調査実施にあたり、In-depth インタビューに多くを依拠した。

顧客数を増やしてはいるものの、CMRDI の研修計画は関係企業等に適切に配布されていなかった。

自立発展性に関しては、おおむね達成していると言える。CMRDI は予算の 30% を政府から得ている。その他の 70% は CMRDI が企業へ提供するサービスの料金で支弁しており、財政面においては、自立発展性に問題はない。組織的には、CMRDI は増員の努力を続けている。ただし、材質評価/品質管理分野では、一層の増員が必要である。3 年から 5 年の中期計画が CMRDI から提示されなかったため、組織としての戦略・方向性は確認できなかった。よって、人員は一分野を除きほぼ問題なく増強されているものの、組織面での自立発展性が十分とは言い切れない。技術的には、機材が必要なときに使用可能な状態になっていることから自立発展性があると言える。

CMRDI が研修プログラムで提供している知識・技術のうち、とりわけ熱処理における故障解析法 (Failure Analysis) の重要性が企業に知られていない。したがって、企業において故障解析法の効果的な使用が進まないおそれがある。

#### 4-5 提言（当該プロジェクトに関する具体的な措置、提案、助言）

CMRDI は非常に有益な研究や技術支援を実施している機関だが、以下の点で改善の余地がある。

(1) CMRDI は具体的な活動計画、目標、予算、リソースを鑑みたくえで、組織として適切な将来計画を策定すべきである。リソースとは、①外部からの必要な技術支援、②必要材料、③必要な人員、④機材、⑤徴収見込みの料金、等を意味する。

(2) CMRDI は次の内容を記録する正確なデータベースの構築およびその管理を行うべきである。①実施した研究・パイロットプロジェクト、②提供した技術支援サービス、③実施した研修プログラム、④サービスを提供した先の企業からクレームがあった場合の原因分析およびその是正・予防策、⑤新しく適用したサービスの実施結果、⑥職員の技能と職員育成計画、⑦顧客企業データベース（サービスに対する各企業のフィードバック、各企業の雇用・生産量・市場占有率・輸出入等の統計を含む）、⑧機材の維持管理・故障状況の記録。

(3) CMRDI は金属加工分野の関連団体や企業との効果的な連携を強化することが望まれる。

(4) CMRDI は科学研究省や通商産業省、投資省などの所有するデータベースにリンクし、雇用動向、民営化動向、輸出入統計等の情報入手を可能にするよう努めるべきである。ただし、これには CMRDI のみならず、関係省庁側からの取組も必要である。

(5) CMRDI は研修コースや支援メニューのマーケティングをより効果的に行い、サービスを提供すべきである。例えば、レーザ切断の研修コースはプロジェクト終了後 4 コースしか実施されていない。プロジェクト実施中のように、より頻繁に開催するべきである。

(6) CMRDI は研修と技術支援サービスに関し、効果的なマーケティングと案内を強化するべきである。

(7) なお、連休が多い時期であったため、本事後評価調査期間（8 週間）は短すぎた。ワーキングデー換算で 10 週間は必要であった。

#### 4-6 教訓（当該プロジェクトから導き出された他の類似プロジェクトの発掘・形成、実施、運営管理に参考となる事柄）

(1) 今後協力を実施する際には、カウンターパートとなる機関が市場重視の感覚を持ち、自身のマネジメントシステムを改善する意識を持っていることが重要である。

(2) 市場を意識しないサービス提供機関では、その機関内部の技術が JICA の技術協力で一時向上したとしても、内部に留まったままで、外部へ普及・波及しない。

(3) マネジメントシステムが強化されると、カウンターパート機関が業務の生産性と質を向上させることができ、結果、サービスが顧客重視で提供できるようになって裨益層が広がり、プロジェクトの波及効果が広がるのが期待できる。

(4) マネジメントシステムはカウンターパート機関が作成するデータベース・記録をもとに構築されるものであるが、そのような情報はプロジェクトの事後評価調査等にも役に立つ。

(5) プロジェクトの投入・成果を最大限活用するため、外部の関連機関との効果的な連携が必要である。カウンターパート機関及び外部機関に連携のための要員を指名することは、連携促進に役立つ。

#### 4-7 フォローアップ状況

まだ具体的なアクションは起こされていない。