

Advanced Manufacturing Systems



Project Sites San Caetano do Sul

1. Background of Project

The Brazilian National Industry Support Services (SENAI: Serviço Nacional de Apoio à Indústria) established SENAI Manufacturing Automation Center in Armando de Aruda Pereira School to develop mid-level engineers in the product automation field in an effort to meet the Brazilian industry's needs. One of these needs has been to enhance their competitiveness by reducing production cost and improving productivity.

To foster engineers who are able to promote the introduction of a computer-driven production system, the government of Brazil made a request to Japan for technical cooperation. Responding to their request, the Japanese government carried out a Project-Type Technical cooperation, the "Manufacture automation center project," from 1990 to 1995, targeting the instructors of SENAI Manufacturing Automation Center.

As SENAI steadily built up work, the Japanese government assessed that SENAI had reached a level that enabled them to transfer technologies to surrounding countries. A Third Country Group Training was thus implemented in 1997.

2. Project Overview

(1) Period of Cooperation

FY1997 – FY2001

(2) Type of Cooperation

Third-country Group Training

(3) Partner Country's Implementing Organization

National Industry Support Services (SENAI), Manufacturing Automation Center in Armando de Aruda Pereira school

(4) Narrative Summary

1) Overall Goal

Training participants introduce their acquired knowledge (the latest computer-driven manufacturing system technology) to the organization to which they belong, and promote usage of the system.

2) Project Purpose

Training participants acquire the necessary knowledge for industrialization with automated manufac-

ture in metal machine manufacturing and other forefront technology

3) Outputs

- The fundamental principle of the forefront manufacturing system is understood, and the operation of CAD ¹⁾ /CAM ²⁾ and the CNC ³⁾ machines is learned.
- The CNC machines and robots are programmed and operated, and the Flexible Manufacturing System (FMS) ⁴⁾ is understood.
- The basics of the control algorithm are understood, the Programmable Logical Control (PLC) ⁵⁾ is programmed and operated, and the control algorithm with servomotor is made.
- An automatic manufacturing system is integrated.

4) Inputs

Japanese Side

Instructors	5
Training expenses	31 million yen

Brazilian Side

Training expenses	1 million yen
Facility, equipment and instructors	

(5) Participant Countries

Argentina, Bolivia, Colombia, Costa Rica, Ecuador, Mexico, Panama, Paraguay, Peru, Venezuela, Chile, Uruguay, and Brazil.

3. Members of Evaluation Team

JICA Sao Paulo Office

(Commissioned to Marcos de Sales Guerra TSUZUKI, Associate professor, Engineering Department, University of Sao Paulo)

4. Period of Evaluation

December 2000 – March 2001

5. Results of Evaluation

(1) Relevance

This training program met the needs of the training instructors in the participants' organizations (educational institutions as vocational training schools and universi-

ties) as well as the needs of Latin America for industrialization. Regarding the recruitment, roughly twice the fixed number applied for the training each year.

The relevance of the Training is assumed to be high since the outcome relates to quality and productivity improvement, as well as economic growth and job creation. The expectations of neighboring countries are also high.

(2) Effectiveness

It has been assessed that the training participants had learned forefront technology and gained knowledge necessary for automated manufacturing and industrialization based on the trainees' self-evaluation. They recognized that their skills in all areas (CNC, CAD/CAM, FMS and PLC) had improved after the training. However, as there were differences in the levels of the participants, the instructors had to conduct additional lectures.

(3) Efficiency

Most of the training participants are satisfied with the contents of the training and the living conditions provided during the stay. Therefore, the input was appropriate both in quality and in quantity.

From August 1998, a new technology related to robotization was transferred to this center by aftercare cooperation for the period of two years. In fiscal year 1999, a training course on robotics was added to the training. This trial utilized the Japanese cooperation in a timely and effective manner.

(4) Impact

The training participants made good use of the course textbook and training materials to diffuse their acquired knowledge, improving their work when they returned to their countries. Moreover, they carried out operational improvements in their organization by revising courses, and applying new contents and methods, such as industrial automation and mechatronics.

According to the questionnaire survey conducted on their organization, 85% of the respondents answered that they experienced progress in machine industry-related activities. Their organization appreciated the participants' achievements.

(5) Sustainability

The facilities and equipment of SENAI Manufacturing Automation Center were satisfactory. They managed to renew part of the equipment and materials by themselves. The center recognized the importance of human resource development in manufacturing areas. Because instructors were of a high level and enthusiastic, they have sufficient ability to conduct training on their own.

However, it is difficult for SENAI to continuously implement a similar scale of training independently due to a gradual decrease of the SENAI budget, which corresponds to the Brazilian economy.

6. Lessons Learned and Recommendations

(1) Lessons Learned

In this project, there were differences in the level of trainees. This kind of problem should be solved by, for example, screening participants after providing distance education prior to the training, or selecting participants



Practical training on PLC Programming

from groups of organizations with a similar knowledge level.

Also for this project, as the participants' levels of comprehension were evaluated along with their attitudes and interest, not enough attention was paid to their level of achievement. Therefore, the only way to measure the achievement was by self-evaluation of the participants. When evaluating the participants in the future projects, attitude and knowledge should be separately considered.

(2) Recommendations

Since CAD is used most frequently after the return of the trainees, the CAD/CAM lectures should be made more interesting.

In this training, there were participants who did not fully understand that robots, CNC machines and FMS contained PLC. It is necessary to adjust the contents and schedule of the lectures in order to give them better understanding.

7. Follow-up Situation

Based on the results of the cooperation to-date, the SENAI Manufacturing Automation Center in Armando de Aruda Pereira School continues to be regarded as the kernel of the Latin American region. In order to transfer forefront technology, a Third Country Group Training "International Manufacturing Automation" is scheduled with a five-year period starting in fiscal year 2002.

1) CAD: Computer Aided Design

2) CAM: Computer Aided Manufacturing

3) CNC: Computerized Numerical Control

4) FMS (Flexible Manufacturing System): The system in which the entire manufacturing system is managed with computers, and tries to make the manufacturing lines comply flexibly with the changes in the products and the amount of production.

5) PLC (Programmable Logic Control): One of the types of sequence control (A system in which a machine is controlled in accordance with the order and the conditions decided in advance), and the contents of the control can be changed in the same ways as the software.

The Maternal and Child Health Improvement Project in North-East Brazil



Project Sites Fortaleza, State of Cear 

1. Background of Project

Health and hygiene indicators for Brazil has fallen in a range similar to those of middle-income countries when comparing the national average figures. However, there has been significant disparities within the nation, and northeast region was at the same level as the least less-developed countries. The Government of Brazil enacted the Unified Health System (SUS) in 1988 and began taking steps toward improving the medical care system. However, even the minimum level of medical service still could not sufficiently reach the poorest population in the northeast region.

Under these circumstances, the Government of Brazil made a request to Japan for a project-type technical cooperation aiming to improve maternal and child health services in Ceara, where the situation was the worst among the nine states in the northeast region.

2. Project Overview

(1) Period of Cooperation

1 April 1996 – 31 March 2001

(2) Type of Cooperation

Project-type Technical Cooperation

(3) Partner Country's Implementing Organization

Ministry of Health, Health Secretariat of the State of Ceara

(4) Narrative Summary

1) Overall Goal

Quality of the maternal and child health services in northeast Brazil are improved.

2) Project Purpose

Quality of the maternal and child health services in the State of Ceara are improved.

3) Outputs

- The level of awareness, knowledge, and technical abilities of the maternal and child healthcare providers in the State of Ceara are increased.
- The obstetric facilities in the hospitals in the pilot areas of the Project and the State of Ceara reference hospitals in Fortaleza are improved in line with the concept of "Humanized Maternity Care."
- The concept of "Humanized Maternity Care" is generally adopted throughout the State of Ceara.
- The awareness and behavior towards sexually

transmitted diseases (STD) prevention by people in the State of Ceara are improved.

4) Inputs

Japanese Side

Long-term experts	8
Short-term experts	36
Trainees received	17
Equipment	146 million yen
Local cost	83 million yen

Brazilian Side

Counterparts	17
Facilities	
Local cost	

3. Members of Evaluation Team

Team Leader:

Takusei UMENAI, Graduate School International Health, Faculty of Medicine, Tokyo University

Evaluation Planning:

Ritsuko SAKAMOTO, Second Medical Cooperation Division, Medical Cooperation Department, JICA

Public Health:

Hiroyuki KAMATANI, Special Advisor, Second Medical Cooperation Division, Medical Cooperation Department, JICA

Project Evaluation:

Shigemi TOKESHI, Environment and Occupational Health Institute

4. Period of Evaluation

9 December 2000 – 22 December 2000

5. Results of Evaluation

(1) Relevance

Amongst the nine states in northeast Brazil, Ceara had the poorest status in maternal and child health, and its improvement was the priority of the Ministry of Health. Therefore, the project had high conformity with the policy of the Ministry of Health and the peoples' needs, thus giving it a high relevance.

(2) Effectiveness

Intensive activities for seminars, workshops and trainers' training, and the launch of an International Conference on the Childbirth held in the year 2000 contributed greatly towards diffusing the concept of "Humanized Maternity Care," and triggered improvement in the quality of maternal and child health services in Ceara. From this angle, the project purpose was achieved well over expectations.

Of note, the training brought a change in awareness to the healthcare workers related to maternal and child health. Furthermore, the local birthrate and rate of normal delivery increased as a result, where 71% of the nurses and 85% of the auxiliary nurses underwent training sessions in the pilot area. According to the RAP (Rapid Anthropological Assessment Procedure) survey, it can be seen that the degree of satisfaction of pregnant women receiving delivery care service, and the degree of fulfillment by workers involved in delivery care service have risen.

However, there was some resistance from some obstetricians and the achievements were hindered in medical centers where they provide treatment. In addition, the nursing association raised objections against providing education for associate nurses.

(3) Efficiency

Inputs were appropriate and taking the satisfactory achievement of the project into account, efficiency could be highly assessed. However, the arrangement of the counterpart staff at the Ceara State Health Secretariat was inadequate, and had some effect on its efficiency.

(4) Impact

This project was widely known under the name "Project Luz (project of light)" throughout Ceara, and its national presence arose through such active public campaign as the international conference, as stated above. Therefore, the concept of "Humanized Maternity Care" attracted not only the surrounding countries, but also attracted other states within Brazil through its training sessions.

Moreover, this project also had an impact on the Government, and it led to establishing a national policy that extended the concept of "Humanized Health Care," which denies excessive medical intervention, to not only maternal and child health but all fields of medical care.

Grass-root networks consisting of workers involved in maternal and child health care, mothers, pregnant women and their families were being formed, and a greater sense of unity and organization of the supporters are expected.

(5) Sustainability

Since the transferred techniques were utilized effectively and the knowledge and skill, which the counterpart had acquired through training, were shared with other health workers, technical sustainability can be considered high.

In addition, by Government ordinance, all state governments and municipal governments are obliged to allocate a certain share of their budgets to the health sector by the year 2004, therefore it is presumed that financial sustainability will also be satisfactory.

However, the Health Secretariat of Ceara, especially significant in the later half, was not cooperative and the concept of "Humanized Maternity Care" was not fully accepted. So there remain slight uncertainty in regards to the effort to apply the concept at the state government level, including the administrative and organizational



Care of a new born baby at a hospital

change in that direction.

6. Lessons Learned and Recommendations

(1) Lessons Learned

In projects where revolutionary change in the maternity health services takes place, as seen in the introduction of the concept of "Humanized Maternity Care" of the project, it is necessary to be fully aware of possible conflicts within the society. In such a case, thorough discussions would have a grave importance, even when there are differences in the opinions between the counterparts on the project purpose and the methods of its achievement. Also, steady and honest activities would gradually attract the frontline workers', users' and counterpart's favor and support the concept that the project is meant to deliver, possibly leading to the project effects.

This project was well accepted at the project sites and triggered the initiative of the local community. The initiative of the local community would often be a key factor for sustainable promotion of the newly introduced concept, therefore proactive approaches to enhance initiative are essential.

(2) Recommendations

In the future, the support on exchanging information, knowledge, and experience in addition to technical cooperation must be considered to further promote "Humanized Maternity Care" in Ceara and other areas in Brazil. It is worth considering to further spread the same concept to other countries.

7. Follow-up Situation

A local NGO has been founded by the counterparts (obstetrician, nurses., etc.) at the project site who is actually involved in "Humanized Maternity Care" activities. Training activities are continued at the site by the NGO.