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ENGLISH

METROLOGY, STANDARDIZATION AND INDUSTRIAL QUALITY

PHASE I AND II

DP/BRA/82/020

BRAZIL

Report of the evaluation mission*

Prepared in co-operation with the Government of Brazil,
the United Nations Development Programme and the
United Nations Industrial Development Organization

United Nations Industrial Development Organization

Vienna

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V.87-81799

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Summary of Evaluation

I. Project number	Title	Date of evaluation
DP/BRA/82/020	Metrology, Standardization and Industrial Quality	24 November - 12 December 1986

II. Summary of project objectives

The Development Objective of the project is as follows:

Within the context of the principal strategic goals of the national development plan to promote self-reliance, optimum utilization of resources and export promotion, the project is designed to contribute to the strengthening of the National System of Metrology, Standardization and Industrial Quality (SINMETRO) to facilitate transfer of technology, to effect modernization, rationalization, import substitution and to improve industrial productivity.

The immediate objective of the project was to:

1. Consolidate the national metrology, standardization and industrial quality system focusing in the two phases of the project on special product lines.

2. Accelerate industrial standardization activities at the national level.

3. Promote the use of standardization, quality control and quality certification at the industrial level.

4. Enlarge scientific, industrial metrological services in the country.

5. Accelerate the national metrification process for industry and commerce.

III. Findings of the evaluation mission

The project has made a broad range of significant contributions towards the strengthening of Brazil's National System of Metrology, Standardization and Industrial Quality (SINMETRO).

The quality of assistance provided has overall been of a high order.

The quantity of assistance provided has however been inadequate to meet fully the stated objectives, such as consolidating SINMETRO, significantly improving industrial productivity, enlarging scientific and industrial metrological services, accelerating the transfer of technology, improving consumer protection and accelerating the national metrification process.

The quantity of assistance provided has been inadequate in relation to that which would be required to meet the objectives, owing to financial constraints imposed on the project. The project should have been more narrowly focussed in order to cope effectively with the decrease of financial resources available to it, thereby ensuring adequate follow-through.

The relevance of the assistance provided was satisfactory, in that the needs in Brazil in the areas assisted are immense and any contribution to provide advice and training can only help to alleviate the gaps and shortcomings.

The sustainability of assistance provided to INMETRO in terms of capacity/capability building has been inadequate for two reasons:

First, the past policy of changing INMETRO presidents and consequently its directors with every change at the central government level has hindered the establishment of an in-house ability to absorb and institutionalize the array of advice provided by the project. Continuation of this practice will render INMETRO permanently dependent on basic technical assistance for an inordinate time to come.

Secondly, given the constraint mentioned above, the assistance provided covered a too broad range of subjects. It can thus at best be considered preliminary assistance, lacking the required intensity to change behavior and conditions sufficiently to create a level of self-sustaining competence.

The project has continued on this basis for too long. Had the project designers used the institution building (capacity/capability building) approach propagated by UNIDO/UNDP, the inadequacy of the planned Government/United Nations inputs and activities to produce the project outputs required to achieve the project objective would have been better detected at the formulation stage.

The project design confused what the project could accomplish with what needs to be created and strengthened within the SINMETRO system.

The project has been further hampered by the lack of a national industrial related quality policy, plans, strategies and programmes along with the human and financial resources required to implement these.

These findings have led the mission to conclude that the project has been less than optimal in terms of effectiveness and ultimate impact.

On the other hand, the project co-ordinator (CTA) and his meticulously selected team of experts have accomplished tremendous work in promoting quality conciousness in the country. In several areas their efforts have catalyzed important quality initiatives, particularly in the steel, wood, leather and textile sectors.

The project has also produced a large body of recommendations which need implementation and follow-up.

Further technical assistance is therefore required in order to achieve a greater impact in selected areas. Such assistance will need to be placed on a more systematic basis if a lasting capability in a specific area is to be created within a finite period of time.

The importance of a properly functioning SINMETRO cannot be overestimated. The Government's approach to increasing industrial quality merits support from the United Nations and further assistance should consolidate and assist in elaborating an integrated industrial quality programme.

IV. Recommendations of the evaluation mission

INMETRO has worked out a strategy for the next years which includes the promotion of quality and productivity at the sectoral and sub-sectoral level. Programmes for the provision of technical assistance to selected industries in the field of quality management have also been proposed.

An operational policy and implementation programme should now be fully developed. Particularly the following actions are required:

(a) Development and approval of a national quality and productivity policy, which inter alia would confirm INMETRO's function of providing promotional, institutional co-ordination and support services at the national level.

(b) Development and implementation of an integrated plan to introduce industrial quality systems that would fully involve Government institutions and agencies, industry technology development organizations, industry associations and selected industrial firms.

(c) Development and implementation of an integrated programme of quality management for small, medium and large companies. The approach would initially be on a pilot/demonstration basis to test mechanisms and action programmes for replicability.

INMETRO's approach to quality and productivity

INMETRO, in its efforts to promote industrial quality systems in industry, must have an approach and a capability to co-ordinate the development and installation of industrial quality systems in co-operation with existing organizations interested or potentially active in this area. Packages need to be developed for selected industry sub-sectors.

Parameters of future international technical assistance are provided below.

The project approach UNIDO/UNDP should follow is one of institution building (capacity/capability building). This means that at the end of any future project a lasting capability should be established in INMETRO to plan, promote and co-ordinate the installation of quality management and quality assurance standards in industry.

The full development of a self-sustaining capability to provide a wide range of quality services to industry will be a difficult and long term effort. What is required now is to plan, design and implement pilot/demonstration programmes in this area in order to learn from experience and to commence developing in-house capabilities at INMETRO and selected co-operating institutions.

While such demonstration programmes are being implemented, the building up of a Quality Division or Department in terms of staff skills and knowledge, work procedures and methodologies would need to be systematically developed, both at INMETRO and at the institutions that will co-operate in the demonstration programme. The objective would be to develop a self-sustaining capability to carry on with future programmes once the project is completed.

For the immediate future the Chief Technical Adviser, together with INMETRO management, will need to prepare a fully worked out proposal of the technical assistance required to support and strengthen INMETRO and those institutions which will be designated to participate in INMETRO's quality programmes.

The existing project should be extended for six months to formulate in detail the programme suggested above. An additional 3 man-months of consultancy should be provided in case specialized advice is required to specify exactly the quality management interventions that will be included in the project proposal.

Recommendations with respect to the present project

During the next six months INMETRO should also reassess all the recommendations made by the CTA and the experts and identify actionable recommendations which have only been partially or not at all implemented. Committees should be established to adapt and subsequently implement them. Close monitoring is required to ensure their full institutionalization and implementation

LIST OF ABBREVIATIONS

SINMETRO	National System for Metrology, Standardization and Industrial Quality
CONMETRO	National Council for Metrology, Standardization and Industrial Quality
STI	Industrial Technology Secretariat, Ministry of Industry and Commerce, serves as CONMETRO's Executive Secretariat
INMETRO	National Institute for Metrology, Standardization and Industrial Quality
DIMEL	Directorate for Legal Metrology at INMETRO
DINOR	Directorate for Standardization at INMETRO
DQUAI	Directorate for Quality Control at INMETRO
CEMCI	Scientific and Industrial Metrology Centre
ABNT	The Brazilian Association for Technical Standards
IPT	Technological Research Institute of the State of Sao Paulo
FETEP	Foundation for Training, Technology and Research
CONACON	National Council for Metrification
PBADCT	Programme for Basic Industrial Technology
CTA	Chief Technical Adviser of the UNIDO/UNDP project
INPM	National Institute of Weights and Measures

CONTENTS

INTRODUCTION

During the 1970s the Brazilian Government gave special importance to developing science and technology, which resulted in the creation of a Secretariat of Industrial Technology (STI) in the Ministry of Industry and Commerce, and also in the launching of a five-year national plan for the development of science and technology (PBDCT). The third national plan, covering the period 1980-85, emphasized the need for "an ample programme of industrial standards, including metrology, quality control and quality certification".

In order to implement the five-year plans, the Government created a national institute for metrology, standardization and industrial quality (INMETRO) in 1973 to accelerate national standards activities handled by a private association and to promote quality control and certification activities, which had been generally neglected. INMETRO was located in the Ministry of Industry and Commerce under STI.

The project BRA/82/020 was launched in 1983 with the objective of consolidating INMETRO by strengthening its standardization, quality control and quality certification capabilities in priority sectors. The project was extended to a second phase in 1985.

Beyond the requirement that all UNDP/UNIDO projects over US$1 million should be subject to an in-depth tripartite evaluation, all parties concerned considered it important to measure the impact the project has had and to assess whether and what international technical assistance would still be necessary in the future.

Detailed terms of reference of the joint evaluation mission are given in Annex I.

The mission started its work in Brasilia on 24 November 1986 and submitted its preliminary conclusions and recommendations to the Government and UNDP/UNIDO on 10 December 1986. The members of the evaluation team were:

Mr. Eiichi Hirata, UNDP Representative
Mr. Francisco Teixera, Government Representative
Mr. Hans H. Heep, UNIDO Representative

The UNIDO Junior Professional Officer in Brasilia, Mr. Wolfgang Mathis, accompanied the team and provided valuable support.

Interviews and discussions were held with UNDP and UNIDO field staff, ministerial officials, public and private sector organizations, and international and national project staff.

A complete list of persons met and organizations contacted is given in Annex II.

CHAPTER I

PROJECT FORMULATION

A. Objective of the project

The Development Objective of the project is as follows:

Within the context of the principal strategic goals of the national development plan to promote self-reliance, optimum utilization of resources and export promotion, the project is designed to contribute to the strengthening of the National System of Metrology, Standardization and Industrial Quality (SINMETRO) to facilitate transfer of technology, to effect modernization, rationalization, import substitution and to improve industrial productivity.

The immediate objectives of the project were to:

1. Consolidate the national metrology, standardization and industrial quality system focusing on special product lines during the two phases of the project.

2. Accelerate industrial standardization activities at the national level.

3. Promote the use of standardization, quality control and quality certification at the industrial level.

4. Enlarge scientific, industrial metrological services in the country.

5. Accelerate the national metrification process for industry and commerce.

The primary function of the project was stated to be 'Direct Support'. However, if one reads the entire document and discusses the intention of project with the authorities, it becomes clear that the project's main function is or should have been 'Institution-Building'.

The project's international staff alone cannot achieve the project objectives. Only INMETRO, together with related institutions, can in the long run accomplish, for example, a consolidation of the national metrology, standardization and industrial quality system. At best, the project's international input in the form of expertise and training can advise, support and develop skills and knowledge to contribute towards this long range goal.

The project objective should have been stated in terms of providing assistance to strengthen SINMETRO's capability to develop standards, establish and implement procedures for international standardization activities, develop and implement quality control systems in industrial units, develop and implement quality certification schemes, promote industrial standardization, quality control and certification, etc.

This issue is further discussed in Chapter I, Section C, pages 21-22.

B. Socio-economic and institutional setting of the project

1. Socio-economic setting

Brazil, whose economy was based essentially on agriculture until the middle of the current century, went through a process of not only modernization but also rapid industrialization. The basic approach adopted for industrial development was the so-called "Import Substitution Strategy". Beginning with non-durable consumer goods, the country was able, through various stages, to establish other branches of the industrial sector, namely durable consumer goods, basic intermediary goods and finally capital goods.

In order to create the capability and capacity to produce goods, it was necessary to install and organize essential services at a rapid rate, by acquiring modern technology and expertise through multi-national and international co-operation. A rapid industrialization process (as high as 10.6 per cent annual growth rate in some years) led to a situation characterized by an imbalance of technical and managerial practices and skills in most of the industrial sectors.

The various multi-national and bilateral collaborations, and the import of technologies and standards of varied origin, caused difficulties in achieving adequate levels of quality in industrial output. This has also led to a multiplicity of specifications and varieties of products. The consequences were, on the one hand, the low rate of competitiveness of Brazilian products in the overseas market and, on the other hand, the lack of a quality oriented production for the internal market.

One of the main reasons for this situation was the absence or low level of basic industrial technology infrastructure, namely in metrology, standardization and industrial quality. The losses due to this are estimated at about 15 per cent of the national industrial production.

It was in order to counteract this structural problem that the Brazilian Government created the Secretariat of Industrial Technology (STI) in the Ministry of Industry and Commerce, directly under the Minister, and prepared and implemented the three national plans for development of science and technology (PBDCTs).

One of the aspects emphasized in all PBDCTs relates to a programme of priority projects of industrial standards, including metrology, quality control and quality certification.

During the early part of 1970s the Government started to establish a central metrology laboratory. At that time, the development of standards was under the ambit of a large number (251) of Government institutions; the national industrial standards activities were handled by a private assocation (ABNT) without adequate human and financial resources; promotional activities relating to quality control and quality certification were negligible, except in a few areas.

In order to harmonize and accelerate standards activities, the Government created in December 1973, through a Federal Law, the National Council for Metrology, Standardization and Industrial Quality (CONMETRO) and its executive organ, the National Institute for Metrology, Standardization and Industrial Quality (INMETRO). Together with the National Institute of Weights and Measures (INPM), now incorporated with INMETRO, they form the National System (SINMETRO).

During the period from 1980 to 1983, Brazil suffered a severe economic recession, reflecting the world economic situation. This recession had far-reaching negative effects on the Brazilian economy, which had to go through a process of adjustment in order to produce the necessary trade surpluses for servicing its debt. At the same time, the country was experiencing extremely high rates of inflation.

This situation emphasized the need to give priority to quality and productivity if Brazilian products were to compete better in the international market. On the other hand, the high rate of inflation was preventing the investments needed to improve the quality of products destined for the internal market.

The economic stabilization plan of March 1986 - mainly aimed at eliminating inflation from the economy - has brought additional responsibility to CONMETRO and INMETRO. The Government is involved in actions to improve the competitive position of Brazilian products in the external market and to protect the internal consumer from abuses connected with its price control programme.

As an immediate measure, INMETRO is to intensify its activities in order to protect the consumer against fraud, both with regard to quality and quantity (weight and measures). Secondly, steps need to be taken to assist the industrial sector to improve its productivity and efficiency, including controlling the supplies of raw materials and improving process technology through rationalization in order to reduce costs and produce goods of uniform quality. Industry must change from its present concept of quality control, namely inspection and testing, to the modern concept of total quality programmes.

The Government of Brazil has given the highest priority to improving quality and productivity, backed up by standardization and metrology. It has also established the following guidelines for selection of priorities:[1/]

(a) To promote the enhancement of productivity and the quality of industrial goods and services, with the objective of improving the competitiveness of Brazilian enterprises;

(b) To concentrate efforts on the development of technologies directly related to national programmes and in strategic areas of industrial development;

(c) To create conditions for the development of independent technology in large- and medium-scale enterprises;

(d) To strengthen the technological capabilities of small- and medium-scale enterprises;

1/ Refer: 1. "Subsidios para o I PND/NR-MIC-Area Tecnòlógica", Brasília, Julho de 1985, 2. A Política Industrial da Nova República, MIC.

(e) To complement the technological infrastructure and reinforce the means of action;

(f) To strengthen the integrated action of all organizations connected with the promotion and execution of technological policies, in order to create high technological capability.

Based on these guidelines, the Government of Brazil has also spelt out the following priority areas for technological development:

- Diffusion of techniques, mechanisms and procedures for improving industrial quality;
- Creation of independent machineries for the inspection and certification of quality in specific sectors, notably in the areas of production of goods with impact on the safety of citizens, such as nuclear energy, aeronautical, transport, etc.;
- Establishment of a network of metrological services;
- Accreditation of laboratories;
- Development of standards, quality and productivity consciousness;
- Stimulation of standardization and rationalization, specially in Government-supported companies and institutions;
- Amplification for legal metrological services to protect the consumer;
- Assistance for the development of technologies of strategic interest and those which assist industrial development;
- Development of technologies for the production and use of liquid fuels and energy conservation;
- Development of technologies specially oriented to social development;
- Development of technology directed to strengthening national industry in the areas of medium- and small scale industries.

The Government is also at present evaluating the Programme for Basic Industrial Technology (PADCT), together with the World Bank, in order to improve, among other goals, the systems of metrology, standardization and industry quality. An information network and the development of human resources form important components of this programme.

This new socio-economic setting has far reaching implications for INMETRO. In order to be able to carry on the priority activities spelt out by the Government, INMETRO will need to assume fully its technical co-ordination executive functions. This may lead to the establishment of a new model of

functioning of INMETRO, after a re-evaluation of its functions in the fields of metrology, standardization and quality, to meet the new demands of the Brazilian consumers.

In line with this, INMETRO has started its strategic planning, which includes the execution of short, medium and long term actions. To summarize, the actions envisaged are:

- Immediate assistance to the economic stabilization plan through defensive measures in the field of legal metrology and health and security products;
- Technological and managerial support to industrial enterprises in the area of quality management;
- Promotion of the new philosophy of quality and productivity (total quality control and quality assurance programmes);
- Institutional and infrastructure strengthening.2/

2. Institutional framework

The National System for Metrology, Standardization and Industrial Quality (SINMETRO) was instituted by Law No. 5,966, December 11, 1973. The system aims at providing an organizational structure and mechanisms to formulate and carry out the national policy for metrology, standardization and certification of conformity in an integrated fashion between public and private Brazilian entities. The normative body of the system is called the National Council of Metrology, Standardization and Industrial Quality (CONMETRO); its Executive Secretariat is the Industrial Technology Secretariat (STI) of the Ministry of Industry. The National Institute for Metrology, Standardization and Industrial Quality (INMETRO) is the System's executive body.

CONMETRO, as a normative body, is responsible for the following activities:

- Formulation, co-ordination and supervision of policy for metrology, industrial standardization and the certification of conformity of industrial products;

2/ Refer: MIC/STI/INMETRO - Projeto "Metrologia, Normalização e Qualidade Industrial no Novo Contexto da Sociedade Brasileira, Junho 1986.

- Ensuring the uniformity and rationalization of the units of measurements used in Brazil;

- Stimulation of voluntary standardization;

- Establishment of standards relative to industrial materials and products;

- Establishment of criteria and products for certification of conformity and penalties in case of transgression of legislation.

- Co-ordination of national participation in international activities involving metrology, standardization and industrial quality.

CONMETRO consists of a Plenary Assembly and Executive Secretariat and Sectoral Houses. The members of CONMETRO are as follows:

Minister of State for Industry and Commerce (President)
Secretary for Industrial Technology (Executive Secretary)
Representatives of the following entities:

Planning Secretariat
Navy Ministry
Army Ministry
Foreign Affairs Ministry
Treasury Ministry
Transportation Ministry
Ministry of Agriculture
Air Ministry
Health Ministry
Ministry for Mines and Energy
Internal Affairs Ministry
Communications Ministry
Labor Ministry
Social Security and Assistance Ministry
Armed Forces General Staff
National Confederation of Commerce
National Private Entities integrating the system, who are exclusively dedicated to standardization activites
Consumer Representatives

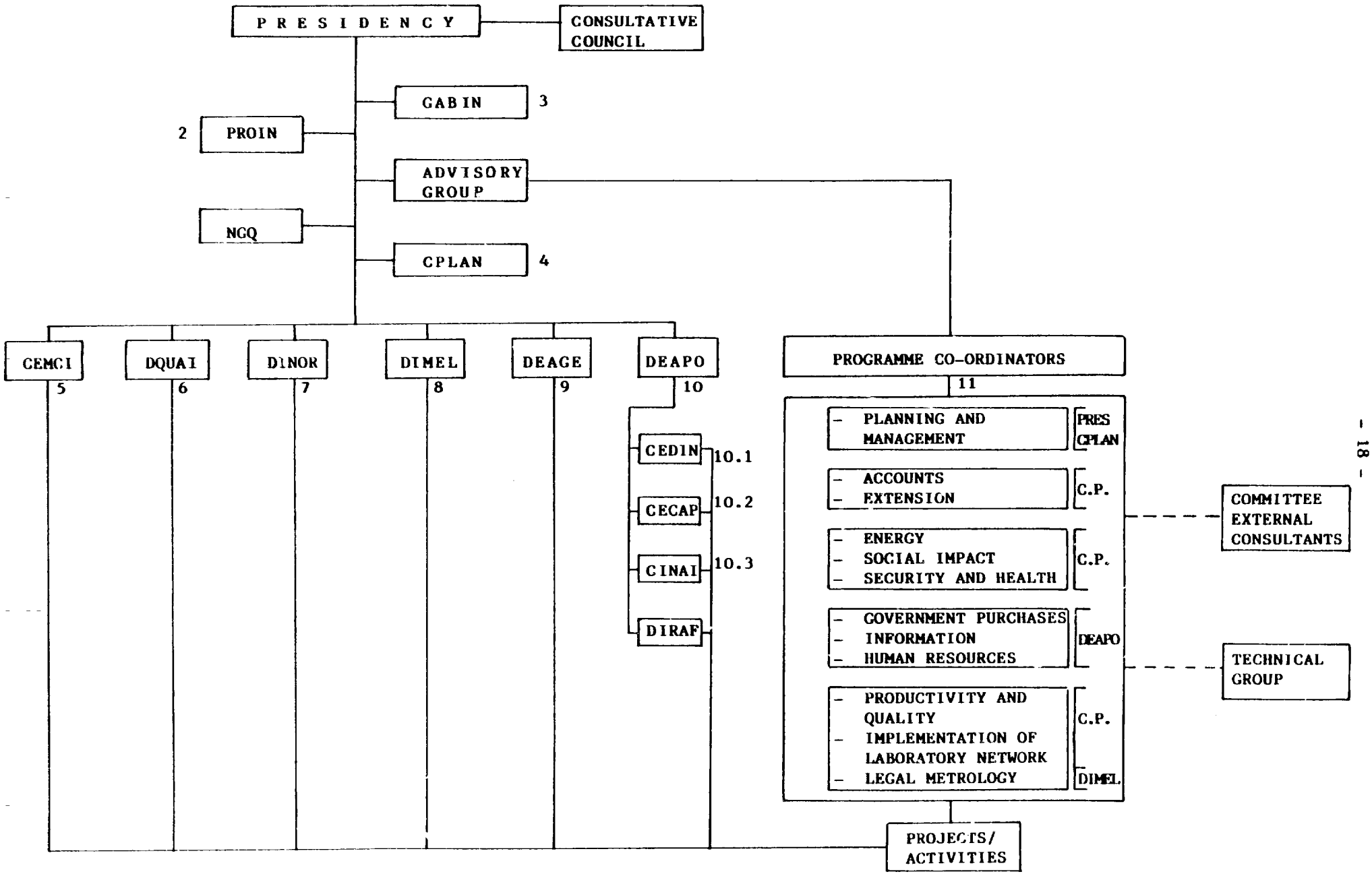
INMETRO, the central executive body, is responsible for carrying out the policy for legal, scientific and industrial metrology, technical standardization and certification of conformity for industrial products and processes, according to the directives established by the CONMETRO.

All national public and private entities carrying out activities related to metrology, standardization and industrial quality are considered as an integral part of the system (SINMETRO), provided they have been granted a registration with INMETRO.

Registration is granted if the national private entity

- carries out activities or projects of interest to the system;
- undertakes a responsibility of fulfilling the directives of CONMETRO;
- presents a programme of work which gets the approval of INMETRO;
- assures uniformity and rationalization on measurement units used in the national territory;
- submits staff for inspection by INMETRO in the activities related to the system, or by a duly delegated body.

INMETRO, a federal agency of the Ministry of Industry and Commerce has the following organizational structure.


PRESIDENCY
CONSULTATIVE COUNCIL
GABIN
3
2
PROIN
ADVISORY GROUP
NGQ
CPLAN
4
CEMCI
5
DQUAI
6
DINOR
7
DIMEL
8
DEAGE
9
DEAPO
10
CEDIN
10.1
CECAP
10.2
CINAI
10.3
DIRAF
PROGRAMME CO-ORDINATORS
11
- PLANNING AND MANAGEMENT
PRES CPLAN
- ACCOUNTS
- EXTENSION
C.P.
- ENERGY
- SOCIAL IMPACT
- SECURITY AND HEALTH
C.P.
- GOVERNMENT PURCHASES
- INFORMATION
- HUMAN RESOURCES
DEAPO
- PRODUCTIVITY AND QUALITY
- IMPLEMENTATION OF LABORATORY NETWORK
- LEGAL METROLOGY
C.P.
DIMEL
COMMITTEE EXTERNAL CONSULTANTS
TECHNICAL GROUP
PROJECTS/ ACTIVITIES

Key to the organizational chart

1. Presidency of INMETRO
2. Legal Department - 12 lawyers
3. Cabinet - 16 university level technicians (ult)
4. Planning Department - 20 ult
5. Center of Scientific and Industrial Metrology - 45 ult
6. Directorate of Industrial Quality - 21 ult
7. Directorate of Standardization - 38 ult
8. Directorate of Legal Metrology - 41 ult
9. Directorate of General Administration
10. Directorate of Support
    - 10.1 Center of Documentation and Information - 20 ult
    - 10.2 Personnel Training Center - 4 ult
    - 10.3 International Co-ordination - 2 ult
11. Informal Structure

    Programme Co-ordinators

The Directorate for Legal Metrology (DIMEL) promotes and enforces systematic gauging in Brazil, through the executive participation of its regional bodies, of all measuring instruments used in commercial transactions.

The Directorate for Standardization (DINOR) is divided into seven sub-sectors: (i) agro-industry, (ii) civil construction, (iii) electro - electronics and energy, (iv) metal-mechanics, (v) chemistry, (vi) transportation, and (vii) special, which is connected to the various industrial segments of Brazil.

Note: The Brazilian Association of Technical Standards (ABNT) has been acknowledged as SINMETRO's national standardization forum. Within its ambit normative tests are generated, where the essence of the technical standard is obtained, which is by consensus between producer, consumer, Government and research organizations.

INMETRO is responsible for the harmonization of Government interests and establishes standardization co-ordination committees to:

- Co-ordinate standardization activiites between organizations;
- Co-ordinate, elaborate and submit to CONMETRO the programme of standardization activities;
- Classify Brazilian standards and verify the accuracy of their tests;
- Approve for registration of standards in the system;
- Analyse the contents of normative tests for the purpose of making them compatible with national interests;
- Co-ordinate and follow-up the performance of standardization work. Issue opinions on standard projects (drafts);
- Promote standardization activities, forming work groups and co-ordinate their activities;
- Follow-up on the international standardization activities.

The Directorate for Quality Control (DQUAI) as determined by CONMETRO is competent for:

- Approving specific regulations for products;
- Approving and revoking the License for Use of Mark of Conformity;
- Issuing the Certificate of Conformity;
- Accrediting laboratories and inspection agents;

- Contacting international organizations (technical level);
- Performing the technical, juristic, administrative and accounting control of the Certification of Conformity System;
- Performing inspection services;
- Testing and issuing technical opinions.

The Scientific and Industrial Metrology Centre (CEMCI), located in Xerem, Municipality of Duque de Caxias, Rio de Janeiro, co-ordinates and performs work related to application of measurements connected with industrial activities within an adequate metrological reliability.

It relies on a complex of laboratories with technical and operational conditions adequate to perform measurements with tolerances and allowances consistant with the instruments to be gauged.

The Centre maintains a National Gauging Network (RNC) of accredited laboratories to effectively enable the decentralization of several types of metrological services.

C. Project Design

Further to the issue of unclear project function specification raised under Chapter I, section A, pages 10-11, the project document has confused what SINMETRO's, particularly CONMETRO and INMETRO as its executive body, task and functions are and what the project can realistically do to support CONMETRO and SINMETRO's huge mandate. Therefore, only CONMETRO and INMETRO, in co-operation with the industrial establishment, can accomplish the stated objectives, i.e. consolidate the SINMETRO system; accelerate standardization activities; promote the use of standardization, quality control and certification and thus increase industrial productivity; enlarge metrological services; accelerate transfer of technology; assist consumer protection; and accelerate national metrification.

The project, with its limited inputs and activities, cannot be held resonsible for the full achievement of the list of objectives cited above.

A preferable formulation of the project objective and project approach should have been the strengthening of the specific capacities and capabilities of INMETRO to carry out its many functions efficiently and effectively. This would have meant that the project should have been designed to provide expert assistance and training inputs to individual departments of INMETRO which require strengthening to be fully able to perform specified tasks.

This would have required a precise specification of each INMETRO task or functional capability in terms of the situation at the time of project approval and planned capability at the end of the technical assistance project.

For each function, the original and planned staffing, including staff members' qualifications and duties, is required, as well as methods and methodologies which the staff will follow. The project could aim at improving the capability of INMETRO to perform some of the following functions:

- Developing, implemencing, auditing and revising standards
- Developing, implementing procedures for participation of regional and international standardization activities
- Developing, implementing quality control systems in various sectors
- Enhancing consciousness of benefits of standardization, quality control and quality certification
- Introducing and implementing collaboration services

  etc.

Although many of the project inputs and activities did serve to strengthen INMETRO's capabilities and capacities, the lack of a systematic institution-building focus caused the project to be less successful in this endeavour than it could have been. Using the institution-building approach would have alerted project planners and implementers to become aware of the too wide focus of the project and insufficienct project resources available to succeed fully in establishing a sustained capability in all the areas selected.

CHAPTER II

PROJECT IMPLEMENTATION

A. Delivery of inputs

UNDP/UNIDO Inputs

The following is a breakdown of the original international personnel component of the budget as amended and approved on 15 February 1985 and the latest budget which reflects the implementation status as at 31 December 1986.

Budget line		Planned Original Budget (m/m)	Implementation Latest Budget (m/m)
	Project International Personnel		
11-01	Chief Technical Adviser	45.0	45.0
11-02	Standardization	6.0	6.0
11-03	Quality Certification	4.0	-
11-04	Metrification	3.0	2.7
11-05	National Calibration	5.0	5.0
11-06	Processed Food Standards	3.0	1.0
11-07	Leather and Leather Products	3.0	2.0
11-08	Wood and Wood Products	8.0	9.1
11-09	Fertilizers	deleted in Phase II	
11-10	Pesticides	4.5	-
11-11	Packaging	4.5	4.8
11-12	Electronic Components	4.0	4.0
11-13	Domestic Electricals	3.0	-
11-14	Building Materials	deleted in Phase II	
11-15	Quality Management Systems	6.0	-
11-16	Company Standards + Quality Assurance	3.0	4.0
11-50	Consultants	1.4	6.8
	TOTAL	98.9	90.4

The personnel component originally totalled $667,820 and now totals $593,325, representing 92% and 90% of the total budget respectively.

Overall, the actual delivery of expert inputs is remarkably according to plan - 91% of planned man/month input has been delivered. Significant

differences can be noted under post 11-03, Quality Certification Expert, and post 11-15, Quality Management Systems Expert, where suitable experts could not be located. The subject areas which would have been covered by these experts are extremely important, especially if INMETRO's role of providing quality support to industry is to be realized. The third of the three columns (standardization, metrology, industrial quality) upon which INMETRO is built thus remains severely underdeveloped as a result of this shortfall.

Other differences are the result of budget constraints, availability of experts in the fields required and changing priorities. Although there are needs in all the areas targeted for expert assistance the Quality Certification and Quality Management Exert shortfall are of the greatest concern.

Overall, the Chief Technical Adviser played an extremely important (and time consuming) role in locating and persuading experts to serve under the project through his international contacts. UNIDO Headquarter's inability to field pre-selected experts in a timely manner was a cause of continuing dissatisfaction to the project management staff at INMETRO. The inability of UNIDO to recruit and field experts in a timely manner should be a subject for a management audit to identify and resolve apparent procedural and implementation bottlenecks in recruitment.

The staff of INMETRO repeatedly pointed out to the evaluation team that together with the Chief Technical Adviser they very carefully planned each expert's assignment, which was confirmed by the team's observations. This included the preparation of carefully worked out terms of reference, detailed activity workplans, detailed reporting requirements including the preparation of a mission report using a prescribed format. The documentary outputs produced are discussed in Chapter III.

The training component of the project was originally planned to be approximately $40,000, only 5% of the total budget of $726,658. This is an unusually small figure for a project of this type. The approach taken towards training was to use the experts to conduct on-the-job training in Brazil and, to complement this, to send key personnel to other countries on study tours to enable them to observe how more advanced organizations, in the areas covered by INMETRO, go about their work. Approximately $45,000 was used for this purpose.

Only approximately $20,000 was spent on equipment which covered a vehicle and office equipment.

Significant was the fact that the Government of Brazil was prepared to cost-share $68,000 of the original $726,658 UNDP budget. For various internal reasons including foreign exchange availability only a portion of this money will be paid to the UNDP.

Government Inputs

In addition to the provision of counterpart facilities (office space, services, furniture, national counterparts, etc.) the Government of Brazil made a cash contribution of Cz$715,000 to cover support personnel, expert travel, training, equipment and operational expenditures.

In general counterparts were available to work with the experts, however understaffing led to sub-optimal on-the-job training opportunities, since fewer counterparts were present than could have been trained.

B. Implementation of activities

The project was seen as an extension of BRA/75/003 "Certification of Iron and Steel", which was considered to have identified the drawbacks of the SINMETRO system and actions required to strengthen it. Priority areas to be addressed by the project were determined in consultation with the Chief Technical Adviser's counterparts and others active in SINMETRO's activities.

The basic implementation approach taken by the project was to:

(i) Examine and recommend improvements of techniques used to prepare, co-ordinate and implement national standards with a view to improve standard formulation in priority areas; increase the number of standards to achieve a consensus of all concerned; increase participation in international standards activities and bring national standards close to international standards, and to seek ways and means to implement national standards. Develop systems to strengthen SINMETRO (CONMETRO, INMETRO, ABNT). Define a national policy.

(ii) Raise consciousness of the importance of standardization, metrology and quality control in Brazil.

(iii) Take direct action to get standards philosophy put into practice at the industrial production level and amongst decision making entities in the system.

(iv) Demonstrate results in priority sectors.

(v) Train a large number of nationals in institutions and industry.

A review of the results achieved is contained in Chapter III. INMETRO identified special product lines requiring special attention by the project. They were:

- Leather and leather products (shoes)
- Wood and wood proucts (furniture)
- Packaging
- Electric components
- Domestic electrical appliances
- Food-processing.

INMETRO's staff greatly appreciated the Chief Technical Adviser's[3/] flexibility in adjusting the project's programme to meet urgent requirements.

The number of experts planned for the project was primarily constrained by the amount of money available. The approach taken was to make the best use of the inadequate funds available. This second constraint was expert availability. For example, neither a quality certification expert nor a preshipment inspection and certification expert could be located, although these areas are very important ones.

3/ The Chief Technical Adviser of the earlier project BRA/75/003 was appointed to assume the project management function of the successor project BRA/82/020.

Practically all experts were short-term; one expert worked eight months and the rest worked between 1 and 6 months.

Brazil is a sophisticated country and only high level experts can provide useful assistance. Such experts are usually not available at the salary levels the United Nations is willing to pay, and they are only willing to work for very short time periods. In many cases the CTA, who had been the Director of the Indian Standards Institute before joining the project, had to use his international contacts to locate and influence experts to accept U.N. assignments. Top experts can command $1,000 to $6,000 per day. In one case an expert, admittedly the top in this field, demanded $15,000 per day plus expenses to give a course. In the end he was hired by the Government. The U.N. pays a maximum of $250 per day.

It is therefore a considerable achievement of the project management to have been able to locate and engage experts who for the most part satisfied the Brazilian counterparts and industrial end-users. Three experts worked at the industry level.

Typically the experts carried out the following activities:

- Lectures to INMETRO staff/industry;
- Discussion with those concerned on technical matters;
- Preparation of plans, assessment papers, recommendations, support documents, programmes, manuals/procedures, etc. in the technical areas covered;
- In some cases, preparation of basic standard texts and assistance to standards committees.

A detailed breakdown of the experts' activities is provided in Annex III.

The evaluation team was able to ascertain that most of the experts worked together as much as possible with counterparts from INMETRO so as to maximize on-the-job training benefits. However, had INMETRO been fully staffed a larger number of Brazilians would have benefitted.

Particularly with respect to the industry level experts, counterpart participation was only part-time, which meant inadequate transfer of skills and knowledge to INMETRO staff to enable them to continue with this important role.

Training primarily involved study tours. Fellowships were considered too time-consuming and expensive given the staffing situation. The individual programmes usually lasted four weeks. The general aim was to familizarize Brazilians with the ways in which other organizations carry out standardization, metrology, industrial quality, calibration, metrification, and quality certification activities. Only eleven Brazilians were able to benefit from the international training programme. Six were from INMETRO and five were from other Brazilian organizations which co-operate with INMETRO. Annex IV gives detailed implementation details. The study tours were well planned and considered very useful by the beneficiaries and their supervisors.

CHAPTER III

PROJECT RESULTS AND ACHIEVEMENT OF OBJECTIVES

A. Outputs

Standardization

One of the more important accomplishments of the project was an evaluation of the present system of national standards development. This evaluation included a comprehensive set of recommendations to improve the rate and quality of standards production. Supporting documents were also prepared to guide in implementing the recommendations.

This documentation included guidelines toward the development of a national standards policy and also to streamline procedures for participation in regional and international standardization activities. Guidelines for effective technical co-ordination of standardization work and management information systems were also provided.

The report and supporting documentation were reviewed by the mission and found to be excellent. Unfortunately the findings have not been fully acted upon. Institutionalization of its recommendations has not taken place. Important outstanding issues include:

- The reorganization of the national standards system;
- A national policy for standardization;
- Procedures required for better participation in international standardization, metrology and industrial quality activities;
- Improved co-ordination mechanisms for national standards work;
- Implementation of an effective standards information system;
- Improved systems to ensure national standards implemention and supporting documentation;
- Implementing improved mechanisms to update existing standards.

Experts and consultants recruited to help in INMETRO's standardization activities generally assisted in the following activities:

- Organization/reorganization of and participation in technical committees, sub-committees and study commissions in their area of competence;

- Identification of priorities and preparation of programmes;

- Provision of technical analysis of ISO standards and national standards from selected countries;

- Provision of comments on Brazilian published/draft standards;

- Development of basic texts in priority standards;

- Implementation of national standards, particularly through lectures to facilitate awareness.

The project staff has prepared a summary table of standardization related outputs which is given below:

Summary of standardization outputs

Outputs	Number
Evaluation of national system of preparation of standards and recommendations to improve	Yes
Technical analyses of standards and comments	48
Basic texts of priority standards (national + company)	204
Participation in technical commissions	38
Lectures on selected topics	23
Papers/reports - technical, special	311
Lectures to technical commissions	10
Seminars/lectures	18
International training programmes	2
Procedures for participation in regional and international standardization activities including GATT and ISONNET contact points	Yes

Metrology

Outputs in this area of activity consisted of:

- Development of guidelines for selection, use, collaboration, control and maintenance of measuring standards;
- Development of quality manual for the operation of the scientific and industrial metrology laboratories;
- Principles established and advice given on the establishment of the network of calibration services;
- Principles established and procedures developed for laboratory accreditation;
- Training of one staff member in standard reference materials;
- On-the-job training of 16 staff members in the above activities and the actual calibration of instruments.

Industrial Quality

Outputs in this area of activity consisted of:

- The generation of consciousness through numerous seminars, lectures and discussions;
- Development and implementation of quality programmes in selected industries (this is discussed in more detail in the following section on Company Standardization, Metroloy and Quality);
- Development and conduct of courses for obtaining accredidation by overseas organizations and to improve national capacity (IBQN, ASME courses);
- Development of model procedures for quality certification of one product;
- Recommendations provided for certification of electronic components and integration with IEC certification programme (not fully implemented);
- Identification of testing laboratory needs in specific areas and training of personnel (this is related to programme in furniture industry);
- Outline of basic principles for preshipment inspection and certification of exports.

Summary of outputs produced as provided by the project staff is given below:

		Number	m/h
1.	Seminars/lectures	114	6970
2.	Implementation of QAP in specific industries	3	
3.	Assisting industries to establish nucleus of QAP	25	
4.	Preparation of Quality Control manuals at industry level	3	
5.	Model procedures for Quality Certification	1*	
6.	Procedures for Preshipment Inspection and Certification of Export	1*	
7.	Training Programmes	31	

*Note: Two consultants on quality certification and quality management systems could not be contracted and important programmes in this area could not be fully accomplished.

Company standardization, metrology and quality

Activities in this area consisted principally in the provision of consulting assistance to interested companies to introduce standardization and quality assurance capabilities through on-the-job training, lectures and the development of basic standards and testing procedures. The experts were considered to have been of high calibre and the reaction of industry was extremely favourable for this kind of assistance.

Assistance was provided to small- and medium-scale industries, primarily in the sub-sectors of leather, textile and furniture industry.

Summary of achievements as provided by the project staff is given below:

	Number	m/h
Quality infrastructure developed	9	
Technical assistance provided	14	
Training	1160 +	8,4177
Seminars/lectures/training courses	57 +	

Metrification

Under this area of the project, metrification work at the national level was taken up. An awareness of the importance of metrification needed to be created, which was accomplished through discussions and lectures; about 42 INMETRO staff were trained in the principles, philosophy and techniques of metrification.

Achievements include the drafting of a national plan for metrification, which was approved by CONMETRO. A National Council for Metrification (CONACON) with its secretariat at INMETRO was established to direct and co-ordinate metrification activities at the national level.

A metrification cell with a co-ordinator and two supporting officers was established. The co-ordinator estimated, however, that he needed a staff of ten. Work is only beginning and a great deal of work will be required to get the co-operation of industrial and other associations to carry out the sectoral work required.

The project has assisted in holding lectures, providing assessments on conversion requirements, preparing guidelines on converting to SI in a typical industrial sector, and in the organization of the secretariat.

The Brazilian metrification co-ordinator was able to study the Canadian system under the project.

Other project results

The CTA, with his past experience as Director of the Indian Institute of Standards, has played an important staff role at INMETRO in advising it in the planning, programming and implementation aspects of its work. The most recent is a four-year plan of action submitted to Government. He was also closely involved in an advisory capacity in several study groups relating to the PADCT discussed on page 14 of this report.

The CTA has actively followed up the implementation of the many recommendations of the experts provided by the project. This includes:

1. Fire Safety Codes for the design of metallic structures - to the study commission completion level;

2. Steel Bridge Code - nearing completion of the study commission level;

3. Rationalization of steels - fully achieved, 1,580 steel varieties have been reduced to 370 - a reduction 76 per cent (started under predecessor project).

The CTA also provided expertise or advice on:

- Basic principles relating to use of national standards for all Government purchases - decision pending;
- Procedures for monitoring quality of common consumer products - decision pending;
- Procedures to formulate emergency specifications to support Government's new economic stabilization plan - decision pending.
- Management information system for INMETRO - decision pending.

B. Achievement of the immediate objective

Policy Issues

Progress towards achieving the project objective as restated Chapter I.C, page 22, paragraph 1, namely to strengthen the capabilities and capacities of INMETRO to carry out efficiently and effectively its many functions as listed in paragraph 1, page 22, has only been incrementally achieved. The unsatisfactory situation at INMETRO is the result of many factors;

INMETRO is the central executive body responsible for the implementation of national policies for legal, scientific and industrial metrology, industrial standardization and industrial quality. Yet a clear and detailed national policy including a plan and programme in this area has not been established. There are many proposals under study, including many developed by the project.

Without policy guidance, it is difficult indeed for INMETRO to plan, programme and implement fully effective activities in the areas for which it is responsible, let alone raise finances and develop staff to implement them.

The role and approach INMETRO should take is presently under study by several working groups, particularly under the Programme for Basic Industrial Technology discussed in page 14 of this report.

INMETRO itself has developed and proposed policy and programmes which, if accepted, will alter the way things are done at INMETRO today. The evaluation team is in basic agreement with the proposal developed by INMETRO[4/], and the recommendations in the present report are supportive of the approach taken, particularly with respect to focussing on quality and industrial productivity. This approach recognizes the need for Brazil to lower production costs, rationalize industry and increase quality where norms/standards, metrology, etc. are instruments to achieve these objectives.

Without clarity and clear mandates for INMETRO it will continue to be difficult for INMETRO to specify in precise terms how to strengthen its institutional capacity or capability.

Institution-building

The second issue is INMETRO's manning table, which presently has approximately 1000 staff with roughly 200 university graduates. The number of staff needed is 500 according to informal opinion in Brazil.

The mission was not able to obtain a proper description of the organization with a manning table showing established posts, those which are filled, qualification of staff in post and job descriptions.

Nor have comprehensive internal policy procedures, guidelines been developed and institutionalized.

4/ INMETRO has proposed twelve programmes; half of them are connected to SINMETRO's infrastructure, including laboratories; the other half incorporate three strategies covering (a) legal metrology and consumer protection, (b) technical assistance to industry and (c) bringing about an environment of quality and productivity.

Overall, the feedback received by the evaluation team during its discussions with both Government and industry was that INMETRO needs industry-oriented staff and more money to promote its programmes.

One major issue is the absence of approximately ten senior people with long experience to provide impetus and manage INMETRO's activities effectively. During the last three years there have been four Ministers of Industry and Commerce and three Secretary Generals at STI/CONMETRO. There has been an equally high turnover of INMETRO's Directors. Under these conditions, institution-building is hardly possible.

As a first step toward maintaining management continuity at INMETRO a permanent technical post of Vice-president should be established.

Only with increased salaries/benefits will INMETRO attract middle management staff with high academic levels and the required industry experience, who can articulate and implement programmes with industry. More talent to do systematic work, to conceptualize and develop programmes and subsequently to co-ordinate, promote and monitor them is required.

Another problem which should be studied is the place of INMETRO within the Governmental hierachy. By definition INMETRO should be playing a co-ordinating role and working with a large member of other Ministries (Agriculture, Health, Science and Technology, to name the important ones). Moreover, INMETRO cannot succeed in establishing industrial quality and productivity alone, it needs to co-operate with a wide range of organizations, associations and programmes to support the programmes proposed. INMETRO's placement under the Ministry of Industry may serve as an extra constraint on INMETRO's ability to assume the pivotal leadership role it needs to assume.

INMETRO is also constrained by its difficult working relationship with ABNT, which, the team understands, itself requires considerable strenghening and clarification of its role vis-à-vis INMETRO. After 25 years many norms and standards are out of date or not implemented. Moreover, its committees often do not represent a consensus. Many committees are inactive. Solutions to these and related problems need to be found.

Overall the project has been instrumental in helping INMETRO maintain visibility in the field of metrology, standards, industrial quality. The project has given it a great deal of advice and assistance in carrying out its mandate and functions. However, all the ingrediants required for progress towards a fully mature INMETRO were never provided nor put into place.

Government and industry circles are fully aware of INMETRO's problems, and actions are under way to resolve them.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

The project has made a broad range of significant contributions towards the strengthening of Brazil's National System of Metrology, Standardization and Industrial Quality (SINMETRO).

The quality of assistance provided has overall been of a high order.

The quantity of assistance provided has however been inadequate to meet fully the stated objectives, such as consolidating SINMETRO, significantly improving industrial productivity, enlarging scientific and industrial metrological services, accelerating the transfer of technology, improving consumer protection and accelerating the national metrification process.

The quantity of assistance provided has been inadequate in relation to that which would be required to meet the objectives, owing to financial constraints imposed on the project. The project should have been more narrowly focussed in order to cope effectively with the decrease of financial resources available to it, thereby ensuring adequate follow-through.

The relevance of the assistance provided was satisfactory, in that the needs in Brazil in the areas assisted are immense and any contribution to provide advice and training can only help to alleviate the gaps and shortcomings.

The sustainability of assistance provided to INMETRO in terms of capacity/capability building has been inadequate for two reasons:

First, the past policy of changing INMETRO presidents and consequently its directors with every change at the central government level has hindered the establishment of an in-house ability to absorb and institutionalize the array of advice provided by the project. Continuation of this practice will render INMETRO permanently dependent on basic technical assistance for an inordinate time to come.

Secondly, given the constraint mentioned above, the assistance provided covered a too broad range of subjects. It can thus at best be considered preliminary assistance, lacking the required intensity to change behavior and conditions sufficiently to create a level of self-sustaining competence.

The project has continued on this basis for too long. Had the project designers used the institution building (capacity/capability building) approach propagated by UNIDO/UNDP, the inadequacy of the planned Government/United Nations inputs and activities to produce the project outputs required to achieve the project objective would have been better detected at the formulation stage.

The project design confused what the project could accomplish with what needs to be created and strengthened within the SINMETRO system.

The project has been further hampered by the lack of a national industrial quality policy, plans, strategies and programmes along with the human and financial resources required to implement these.

These findings have led the mission to conclude that the project has been less than optimal in terms of effectiveness and ultimate impact.

On the other hand, the project co-ordinator (CTA) and his meticulously selected team of experts have accomplished tremendous work in promoting quality conciousness in the country. In several areas their efforts have catalyzed important quality initiatives, particularly in the steel, wood, leather and textile sectors.

The project has also produced a large body of recommendations which need implementation and follow-up.

Further technical assistance is therefore required in order to achieve a greater impact in selected areas. Such assistance will need to be placed on a more systematic basis if a lasting capability in a specific area is to be created within a finite period of time.

The importance of a properly functioning SINMETRO cannot be overestimated. The Government's approach to increasing industrial quality merits support from the United Nations and further assistance should consolidate and assist in elaborating an integrated industrial quality programme. Recommendations in this direction are made in the following section.

B. Recommendations

1. INMETRO has worked out a strategy for the next years which includes the promotion of quality and productivity at the sectoral and sub-sectoral levels. Moreover programmes for the provision of technical assistance to selected industries in the field of quality management are proposed.

2. Future assistance should focus on INMETRO's plans to promote quality and productivity at the industry level. Such assistance would need to recognize that metrology, certification and standards are tools which can be used to achieve quality, thus increasing productivity.

3. An operational policy and implementation programme should now be fully developed. Particularly the following actions are required:

(a) Development and approval of a national quality and productivity policy, which inter alia would confirm INMETRO's function of providing promotional, institutional co-ordination and support services at the national level.

(b) Development and implementation of an integrated plan to introduce industrial quality systems that would fully involve Government institutions and agencies, industry technology development organizations, industry associations and selected industrial firms.

(c) Development and implementation of an integrated programme of quality management for small, medium and large companies. The approach would initially be on a pilot/demonstration basis to test mechanisms and action programmes for replicability.

4. In relation to (b) and (c) above, UNDP/UNIDO have already provided expertise to assist INMETRO and through INMETRO to introduce a quality consciousness in selected industries.

5. It is recommended that the approach followed by the project be systmatized. The methodologies followed by the two experts who have actively assisted industry should be carefully assessed by INMETRO. The most successful practices of their programmes should be identified. Based on this work an operational policy and implementation progamme should be developed.

6. INMETRO should continue to promote, co-ordinate and provide basic support services dealing with:

- Legal metrology;
- Maintenance of a calibration service, including consumer protection activities;
- Scientific, industrial metrology;
- Standardization;
- Metrification.

INMETRO's approach to quality and productivity

7. INMETRO, in its efforts to promote industrial quality systems in industry, must have an approach and a capability to co-ordinate the development and installation of industrial quality systems in co-operation with existing organizations interested or potentially active in this area. Packages need to be developed for selected industry sub-sectors.

8. INMETRO would need to develop, promote and co-ordinate quality programmes from a management perspective, which would entail the development and installation of improved operational practices at the factory level. This approach would mean developing quality standards, against which management can assess performance. The quality management concept would involve specification of management functional relationships vis-à-vis quality policy, management systems and procedures, and quality technology systems which need to be employed to achieve the required product quality in a cost-effective manner.

9. The introduction of industry-based quality systems models would require:

Quality policy guidelines covering the aspect of overall intentions and objectives of organization formally expressed by management.

Quality management guidelines covering that aspect of the overall management function that determines and implements quality policy.

Quality control guidelines and procedures covering operational techniques and activities that are employed to satisfy quality requirements.

This would include:

(a) Quality system design in terms of elements to be included, quality technology to be used in each of the elements, the organizational procedures, the necessary skills and training, the criteria to measure the quality achieved, and the criteria to measure the cost effectiveness;

(b) Necessary action specification required to achieve the quality needed (improved production practices); quantifying the level achieved; measuring and controlling the quality costs;

(c) Design and installation of quality documentation system including quality achievements;

(d) Design and installation of systems to monitor costs, risks and benefits of proposed and operational quality systems.

Quality assurance guidelines and procedures covering all planned and systematic actions necessary to provide adequate confidence that a product, process or service will satisfy a given quality requirement.

This would include:

(a) Procedures to assess the adequacy of the quality system in terms of the quality elements included, the quality technology employed in the elements, the organizational procedures, the necessary skills and training, the criteria to measure quality achieved, and the criteria to measure the cost-effectiveness;

(b) Quality system audit procedures including assessment of quality achieved and quality system documentation.

Quality system guidelines and procedures covering the structure, responsibilities, procedures, activities, capabilities and resources that together aim to ensure that products, processes or services will satisfy quality needs.

To effectively install quality systems industry-wide INMETRO, together with competent industry service institutions and associations, would need to develop system element standards along with guidelines or requirements (as appropriate) for applying these system elements. The following elements for indicative purposes should be considered for a producer's quality system:

Management policy and responsibilities;
Quality system principles and review;
Contract review;
Quality cost considerations;
Quality in marketing;
Product design development and specification;
Documentation control;
Purchasing procedures;
Identification and traceability of product units;
Production process control;
Control of measuring, inspection and test processes;
In-process and final product inspection and testing;
Control of non-conforming product/services;

Corrective action procedures;
Product handling, storage, packaging and delivery;
Quality records and documentation procedures;
Audit procedures, internal and external;
Training;
Installation and service of product;
Statistical techniques and sampling procedures;
Modification and change control.

10. The overriding principle of the quality management systems framework outlined above should be directed towards failure prevention and the improvement of the product itself.

Technical Assistance Requirements

11. Pending decisions on the above, it is impossible to make detailed recommendations on international technical assistance inputs, activities and outputs. However, the parameters of future international technical assistance to be provided are given below.

12. The project approach UNIDO/UNDP should follow is one of institution building (capacity/capability building). This means that at the end of any future project a lasting capacity and capability should be established in INMETRO to plan, promote and co-ordinate the installation of quality management and quality assurance standards in industry.

13. Before such a project can be fully detailed, a Government decision is required to support the project objective. In addition, the external factors which may facilitate are hinder the project need to be carefully addressed. Issues include:

- Continuity of leadership at INMETRO;
- Continuity of senior staff at INMETRO;
- INMETRO's ability to attract and retain qualified staff, especially after they have been trained by the project;
- INMETRO's ability to obtain financial resources to back up programmes propagated by the organization.

14. Another aspect or factor which will influence the effectiveness and impact of future assistance will be the ability of the Government to establish the appropriate linkages and co-operative arrangements with

participating institutions and industry. INMETRO should not and cannot act alone in the proposed quality programme. Planning would then also require establishing clear lines of responsibility and authority amongst the institutions involved. Further clarification and agreement on the roles to be played by the institutions involved in the project will need to be established.

15. This is required since the proposed effort will need to harmonize and integrate resources, technology and human effort if the development objective of industrial quality and productivity is to be achieved.

16. An integrated system approach is thus called for to tie in the various sub-systems of the technology system with the industry system.

17. INMETRO must therefore promote its programmes in co-operation with relevant industrial technology transfer and extension service institutions so that quality concepts and the capability to introduce them into industry are also established in these institutions.

18. The full development of self-sustaining capability to provide a wide range of quality services to industry will be a difficult and long term effort. What is required now is to plan, design and implement pilot/demonstration programmes in this area to learn from experience and to commence developing in-house capabilities at INMETRO and selected co-operating institutions.

19. While such demonstration programmes are being implemented, a Quality Division or Department should be built up in terms of staff skills and knowledge, work procedures and methodologies that would need to be systematically developed, both at INMETRO and at the institutions that will co-operate in the demonstration programme. The objective is to develop that a self-sustaining capability/capacity to carry on with future programmes once the project is completed.

20. For the immediate future the Chief Technical Adviser, together with INMETRO management, will need to detail a fully worked out proposal of the technical assistance required to support and strengthen INMETRO and those institutions which will be designated to participate in INMETRO's quality programmes. It is expected that this will require:

- Identification of sub-sectors which will benefit from the demonstration programmes;
- Identification of institutions (public and private) which are willing to co-operate;
- Discussion, negotiation, identification and formulation of programmes and plan of actions;
- Assessment of skills and other resources available locally to carry out the programme;
- Specification of the skills and experience required from external sources to supplement this effort;
- Formulation of INMETRO staff skills composition required and actions needed to develop missing skills so that a full capacity will be created by the end of the project.
- Formulation of institutional capability and capacity building activities required to strengthen SINMETRO.

21. This would necessarily include specifications for a training programme for support staff at the national level (INMETRO), participating independent technical supervision agencies at the sectoral (FETEP, CEAGS), and industry levels (industry associations, group associations, associations of technicians and engineers).

Immediate action required

22. The existing project should be extended for six months to formulate in detail the programme suggested above. An additional 3 man-months of consultancy should be provided in case specialized advice is required to specify exactly the management interventions that will be included in the project proposal.

Recommendations with respect to the present project

23. During the next six months INMETRO should reassess all the recommendations made by the CTA and the experts and identify actionable recommendations which have only been partially or not at all implemented. Committees should be established to adapt and subsequently implement them. Close monitoring is required to ensure their full institutionalization and implementation. Outstanding proposals include:

- Standards information system for monitoring the status of standardization activities particularly standards implementation. Information should be generated on how many and what kinds of material standards are published, reconfirmed, revised or abolished. It should also include information on the status of draft standards. Such information should be provided in a national standards yearbook.

- Streamlining of standards development procedures including reorganization of standards-making committees and the augmentation of standards-making capacity by using industry-related assocations for the relevant sectors in addition to ABNT.

- Guidelines on publicity implementation.

- Guidelines on preparation of comprehensive specification, technical co-ordination of standardization work.

- A suggestion for a management information system for INMETRO.

- Plan for the development of human resources at INMETRO.

- Metrology quality manual implementation.

- Fire safety code implementation.

- Steel bridge code implementation.

- Proposal on basic principles on the use of national standards for all government purchases.

- Procedures on monitoring quality of products.

- Procedures to formulate emergency specifications to support economic stabilization.

- Recommendations for a National Standards Policy.

- Effective follow-up systems for updating existing standards.

- Processing into national standards basic texts of all priority standards prepared by experts.

- Early action to set up full network of national calibration services.

- Early action to finalize procedures for accreditation of laboratories, inspection agencies and independent certification bodies.

Annex I

JOINT EVALUATION MISSION

OF THE GOVERNMENT BRAZIL/UNIDO OF BRA/82/020

METROLOGY, STANDARDIZATION AND INDUSTRIAL QUALITY

Terms of Reference

Background to Evaluation

During 1970's the Brazilian Government gave special importance to Science and Technology which resulted in the creation of Secretariat of Industrial Technology (STI) in the Ministry of Industry and Commerce (MIC), and also in launching a 5-year national plan for development of science and technology (PBDCT). The third plan, covering the period 1980-1985, emphasized on "an ample programme of industrial standards, including Metrology, Quality Control and Quality Certification".

On the other hand, the Government created the National Council for Metrology, Standardization and Industrial Quality (CONMETRO) and its executive organ, Instituto Nacional de Metrologia (INMETRO), in 1973, in order to accelerate national standards activities handled by a private association, and to promote generally neglected quality control and certification activities, INMETRO was located in MIC under supervision of STI.

International technical assistance was sought since then to assist INMETRO in adopting standards to the national needs in the industrial sector. UNDP/UNIDO responded in assisting through several projects (BRA/71/560, BRA/75/003, BRA/76/008), which were reportedly successful in the area of Iron and Steel metrication.

BRA/82/020 was launched in 1983 upon further request from the Government to consolidate INMETRO through the strengthening of standardization, quality control and quality certification in the priority sectors covered by National System of Metrology, SINMETRO. The project was extended to the second phase in 1985.

Immediate Objectives of the project are:

- Consolidate the national metrology, standardization and industrial quality system, focusing on special product lines.

- Accelerate industrial standardization activities at the national level.

- Promote the use of standardization, quality control and quality certification at the industrial level.

- Enlarge scientific, industrial metrological services in the country.

- Accelerate the national metrication process for industry and commerce.

In the second phase, the following objectives are added.

- Promote exports.

- Accelerate transfer of technology.

- Assist consumer protection.

Initial UNDP input to the project was US$374,000, covering the period from April 1983 to December 1984. The latest figure is US$636.918 (according to most recent signed revision "J") covering until December 1986.

Considering that Standardization and Quality Control continue to be one of the priorities for the Government of Brazil, high possibility exists for UNDP/UNIDO to be sought further cooperation in this area in the 4th Country Programme (1987-1991). Therefore, it is critical for all the parties concerned (Brazil/UNDP/UNIDO) to measure the impact of the project in the past 4 years, and assess whether and how international technical assistance is still necessary in the future, before the termination of project BRA/82/020 in December this year. That is why the in-depth external evaluation is initiated now by UNDP, as discussed at the tripartite meeting held in February 1986. This evaluation will be especially significant, since no evaluation mission took place in 1984, though it was stated in the original project document, as a condition for the extension to the second phase.

Purpose and Methods

There are two major purposes for the evaluation.

I. Measure the impact of the project to INMETRO, and to the industrial society in general, if any.

II. Assess whether or not international technical assistance is still necessary in the field of Standardization and Quality Control in the 4th Country Programme. If the answer is positive the mission will elaborate the modality of it.

In the course of evaluating the project for the above two purposes, the mission is expected to answer to the following questions.

1) Relevance of the project and its design.

- Was the project designed in a logical and coherent way to give certain impact to the target population?

- Are the project's immediate objectives realistic in view of the outputs produced within 2 (later 4) year's time?

- Does the project design make the distinction between what the institute should produce while it is being developed by the project, and what the project itself should produced during 2 (later 4) years?

- Are immediate objectives formulated to allow for measuring or assessing the project's achievement? If not, what criteria will the mission use to assess project performace?

2) Effectiveness of the Performance of the Project and its Results.

- Have all the outputs of the project been achieved? If not, how much have been achieved?

- What have been the factors, if any, that have deterred the achievement of the project's outputs?

- Have the outputs contribute towards the achievement of the projects immediate objectives. If yes, how? If not, why?

- How can the outputs of the project be compared with international level of Standardization and Quality Control?

- Was the institutional arrangement most appropriate? Does INMETRO actually have the capacity to take necessary initiative in national standardization and quality control, and provide appropriate information to the industries and consumers?

- What remains to be done, and why?

3) Efficiency of the Management of the Project.

- What, if any, have been the management problems encountered in the course of project implementation?

4) Others.

- Is it advisable to continue international technical assistance, or should it be left to INMETRO and industries concerned, in order to cultivate self-reliance? If external technical assistance is yet necessary, in what specific issues and in what methodology?

Besides the answers to the above questions, the mission is encouraged to include any other relevant findings and recommendations as long as the time constraint allows.

The results of the evaluation should be recorded in a draft report, to be prepared by the leader of the Evaluatory mission. This report should be available at the end of the mission, when a debriefing meeting with all concerned parties will take place.

Composition of the Mission

1.) Mr. Eiichi Hirata, Manager, Quality Standards Department, Engineering, Research & Development Division, NIPPON KOKAN KK. Japan, on behalf of UNDP

2.) Mr. Hans-Heinrich Heep, Evaluation Officer, Office of the Director-General of UNIDO, on behalf of UNIDO

Timetable and Itinerary of the Evaluation

The duration of the mission is for 3 weeks. The planned itinerary is as follows in chronological order.

1. Brasilia for 2.5 days

- Briefing at UNDP and UNIDO Field Office for 2 days. (1st day, oral briefing by UNDP Resident Representative, SIDFA-UNIDO Representative and Officers-in-charge; 2nd day, working with the files).

- Meeting and analyses in STI in the morning. (information on the PBDCT, INMETRO's institutional arrangement, etc). In the afternoon departure for Rio de Janeiro.

2. Rio de Janeiro 7 days (subject to change)

- Working at INMETRO (Briefing by the President of INMETRO, Project CTA, interviewing concerned people, checking files etc). During this period, the mission feel free to physically go out of INMETRO for information gathering (such as visiting industrial associations etc), including travel to other parts of Brazil. Necessary funds will be provided by UNDP.

3. Brasilia for 5 days.

Finalizing a draft report of the mission and debriefing, including meetings with SUBIN (Departament of International Economic and Technical Cooperation, Secretariat of Planning) and DCOPT (Division for Technical Cooperation, Ministry of Foreign Affairs).

Consultations in the field

- The mission will maintain close liaison with the UNDP Resident Representative in Brazil, the concerned agencies of the Government, any members of the international team of experts, the counterpart staff assigned to the project, as well as UNIDO field staff in the country.

- Although the Mission should feel free to discuss with the authorities concerned anything relevant to its assignment, it is not authorized to make any commitments on behalf of the UNDP or UNIDO.

Reporting

Mr. Eiichi Hirata is responsible for coordinating and finalizing the report on the evaluation.

The report should be prepared in draft in the field along the lines indicated in the attached outline. It should be presented to the Government before the mission leaves Brazil, so that there is an opportunity to discuss about it. The report should be submitted in final form to UNDP and UNIDO. The UNDP will be responsible for formal submission of the report to the Government and for reporting on the results of the evaluation to the Governing Council of UNDP.

Deadlines for the report.

.A draft report: before the last day of the mission.

The final report: 30 days after the end of the mission, upon derestriction from the Government.

Annex II

LIST OF PERSONS MET AND
ORGANIZATIONS CONTACTED

Brasilia

1. UNDP

* Peter Koenz, Resident Representative
Walter Franco, Deputy Resident Representative
* Marco Borsotti, Assistant Resident Representative

2. UNIDO

Luis Soto-Krebs, Senior Industrial Development Field Adviser
* Wolfgang Mathis, Junior Professional Officer

3. SUBIN (Secretariat for International Economic and Technical Co-operation)

Alice Pessoa Abreu, Adviser
* Thels Carvalho Lopes, Technical Adviser
* Huberto S.R. Tanure, Adviser

4. STI (Secretariat of Industrial Technology)

Jose Walter Bautista Vidal, Secretary General
* Carmen Soriano-Puig, Department for International Co-operation
* Rubins Gallina, Coordinator, Executive Secretariat, Conmetro
* Jose Eustachio M. de Carvalho, Adviser

5. MME (Ministry for Mines and Energy)

Lourival do Carmo Monaco (before: Secretary General, STI)

6. MCT (Ministry of Science and Technology)

Agide Gorgatti Neto (before: Director of EMBRAPA, Brazilian Institute for Agricultural Research)

7. CEBRAE (Brazilian Institute for Assistance to Small and Medium Enterprises, Ministry of Industry and Commerce)

Rodolfo Herdes, Adviser/International Affairs

9. EMBASSIES

CANADA: Gilles Bernier, First Secretary, Technical Co-operation
Jean Pasadzki, Senior Assistant, CIDA Programme
FRANCE: Henry de Cazotte, Attaché, Technical Co-operation

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* Attended evaluation tripartite review.

RIO DE JANEIRO

1. INMETRO (National Institute for Metrology, Standardization and Industrial Quality)

* Masao Ito, President
* B.S. Krishnamachar, UNIDO Chief Technical Adviser, Project BRA/82/020
* Claudio Loewenstein, Director, International Coordination Division
Darcy Gil Netto Mello Moraes, Deputy Chief, Electrical Division
Marcio de Barros, Chemical Engineer Technician, Chemical Engineering Division
Emmanual Istodor Berceanu, UNIDO Expert in Wood and Wood Products Furniture
Maria Virginia Ruas Santos, Chief, Training Centre (CECAP)
Fatima Leone Martins, Chief, Chemical Department
Celso Carreiro Ildefonso, Chief, Department Metrification
Ricardo Barbosa de Oliviera, Manager, Accreditation Department
Joseph Brais, Coordinator of Three Special Projects (former Director Standardization)
Hugo Tulio, Planning Chief
Prof. Juarez Tavora Veado (Ex-President INMETRO)

2. IBQN (Brasilian Institute for Nuclear Quality)

Jose G.A.L. Bittencourt, Director

XEREM, DUQUE DE CAXIAS

INMETRO, CEMCI (Scientific and Industrial Metrology Center)

Eduardo Luis Silva, Deputy Director, Calibration Co-ordination
Jose Joaquim Vinge, Chief, Electrical Division, DC Current and Voltage, Standard Cells
Joern Zinkernagel, German Technical Co-operation Expert, Basic Agreement on Technical Co-operation between Brazil and the Federal Republic of Germany

SAO PAULO

FIESP (Federation of the Industries of the State of Sao Paulo)

Ricardo Frank Semler, Deputy Director, Department of Technology (DETEC)
Joice Joppert Leal, Chief, Industrial Development, DETEC
Leda Mattar, Technical Adviser/Technological Training
Mario Cyrne Bezerra, Technical Adviser/Industrial Quality

CUBATAO, SAO PAULO

COSIPA (Companhia Siderurgica Paulista)

Sergio Matheus A. Mattos, Director Operations
Guillermo Guembes Vidal, Adviser to Director Operations

Annex III

EXPERTS' ACTIVITIES

B.S. KRISHNAMACHAR

Chief Technical Adviser (CTA)

Period: Since start of project BRA/82/020 (April 1983 - present)

Job executed:
- Development of project after discussions and identification of priorities with all concerned
- Preparation of job descriptions and programme of work for experts
- Search for experts
- Preparation of field work and counterparts for experts
- Interaction with STI/CONMETRO ABNT and industrial units and institutions
- Giving lectures
- Conducting training courses
- Development of INMETRO training programmes
- Development of training programmes for ABNT
- Following-up of recommendations of experts
- Interaction with Chairman and members of selected ABNT Committes
- Assistance in preparation of standards
- Assistance in company standards activities
- Other activities related to project and standardization (PADCT, Government purchases, etc.)
- Working with President of INMETRO to develop programmes and plan for INMETRO
- Miscellaneous

N. GANAPATHY

Metrification expert
Period: 1.5 months (September - November 1983)
Job executed:
- Lectures to INMETRO personnel - 2
- Lectures to associations of industries - 9
- Discussions with all concerned
- Preparation of national plan for metrication
- Preparation of procedures for implementation of national plan
- Recommendations for priorities and actions
- Training
  - INMETRO (12)*
  - Others (5)

MARY CRAINEY

Documentation expert
Period: 1.5 months (November - December 1983)
Job executed:
- Lectures to INMETRO personnel
- Discussions
- Preparation of papers relating to implementation of GATT enquiry point and procedures
- Preparation of recommendations for ISONET enquiry point
- Training of INMETRO personnel on the job (14)

T. RAJARAMAN

Standardization expert
Period: 8 months (August 83 to February 84)
Job executed:
- Evaluation of present system jointly with CTA and making recommendations
- Preparation of support documents to implement recommendations
- Development of basic texts of standards scrutiny and comments on existing standards (4)
- Training INMETRO personnel (4)

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* Figures in brackets are approximate.

T. RAJARAMAN

Electronic Components expert
Period: 2 months (February to April 84)
Job executed:
- Evaluation of present status, identification of priorities and recommendations for accelerated programme
- Discussions
- Lectures (4)
- Training lectures (5)
- Notes for calibration system
- Recommendations for procedures for quality assurance and link with IEC system
- Preparation of basic texts of priority standards (17)

KURT H. GARMIN

Packaging expert
Period: 4.5 months (September 84 to January 85)
Job executed:
- Seminar on packaging (1)
- Discussions
- Assistance to structure technical committee (ABNT) and its sub-committees
- Procedures for working of sub-committees
- Attending ABNT commissions (5)
- Review of existing packaging standards and comments
- Programme and priorities
- Documentation of existing reference material and standards
- Preparation of basic texts (13)
- Training INMETRO personnel (2)

ALBERTO SOFIA

Leather and leather products expert
Period: 2 months (March to May 85)
Job executed:
- Lectures to industries and associations (15)
- Visists to tanneries and shoe factories (10)

- Training persons in laboratory (8)
- Training course to industry (4)
- Study of present quality assurance programme in industry and offering suggestions for improvement (4)
- Attend ABNT technical committees (3)
- Documentation of existing reference material, standards and overseas institutions
- Preparation of basic texts for priority standards (24)
- Preparation of technical specifications at company level (3)
- Training
    - INMETRO personnel (1)
    - industry personnel (29)

EMANUEL ISTODOR-BERCEANU

Furniture expert
Period: 5.0 months (March to July 85)
Job executed:
- Lecture to industry and associations to promote consciousness (13)
- Discussions
- Visits to industries and offering suggestions to improve quality (12)
- Training counterpart personnel (10) in the Technological Institute (FETEP)
- Development of quality manuals for industry and other basic material for furniture manufacture (4)
- Implementation of three pilot projects for standardization and quality assurance programme in industry
- Assisting laboratory to fabricate equipment for testing furniture
- Preparation of a mobile laboratory kit (1)
- Attending ABNT technical commissions
- Preparation of basic texts of priority standards (40)
- Assisting installation of a documentation centre at FETEP
- Preparation of company standards (5)

GUILLERMO GUEMBES VIDAL

Company Standardization and Quality Assurance expert
Period: 4.0 months (March to July 86)
Job executed: - Lectures to industries and associations to promote consciousness (50)
  - furniture
  - textile
  - mechanical
  - leather and shoes
- Lectures to top management in above industries (20)
- Working with industry to implement nucleus of company standards and develop company standards (118) and training them to implement the same (16)
- Training personnel in industry (around 200)

ROBERT PAUL SHIMKUS and

MICHAEL RIOS GONZALEZ

ASME and API Codes experts
Period: 2 weeks (July 86)
Job executed: - Seminar for two weeks for industrial units (40) and IBQN. The objective of the seminar was to assist the Brazilian industry in recognizing the programme requirements associated with obtaining and maintaining a license for the API and ASME monograms and providing an insight to the applications of API and ASME quality programmes to the current Brazilian manufacturing industry.

JOHN H. BUCKINGHAM

Metrology expert (National Calibration Services)
Period: 4 months (July to November 86)
Job executed: - Training INMETRO personnel on the job (12)
- Lectures to INMETRO personnel
- Lecture to other laboratories (6) on calibration and accreditation

- Suggestions for criteria for accreditation of measurement laboratories to the national system
- Suggestions for establishment of national calibration services
- Development of quality manual for the Centre for Scientific and Industrial Metrology of INMETRO

ANTHONY RUSSELL

Laboratory Accreditation expert
Period: 1 month (August-September 86)
Job executed:
- Training counterpart personnel in INMETRO (4)
- Evaluation of present thinking at INMETRO and making constructive suggestions for evolving sound principles for accreditation of testing laboratories by INMETRO
- Written propcsals for laboratory accreditation
- Visits to a few selected laboratories to study the present situation (4)
- Lectures to outside laboratories (4) and to INMETRO personnel

ALFRED FINK

Furniture laboratory expert
Period: 3 weeks (August-September 86)
Job executed:
- Working closely with FETEP and furniture industry to evaluate the existing facilities for furniture testing and proposing modifications and additions
- Lectures to industry to promote quality
- Detailed proposals for furniture laboratory including equipment needed and a lay-out

N. GANAPATHY

Metrification expert

Period: 1 month (return mission) (August-September 86)

Job executed:
- Reviewing implementation of earlier work
- Lecture to INMETRO counterpart personnel (1)
- Lecture to industry on SI conversion (4)
- Attending ABNT/INMETRO meetings (2)
- Preparation of special reports to assist INMETRO to implement the metrication programme and convince industry (4)

EMANUEL ISTODOR-BERCEANU

Furniture expert

Period: 4 months (August to December 86)

Job executed:
- Assisting IPT to establish a furniture testing laboratory
- Identify equipment
- Training personnel in standardization, quality control and quality certification (4)
- Preparation of complete documents for instituting an integrated quality assurance programme in the furniture industry
- Participation in seminars of furniture makers
- Lectures to universities
- Attend ABNT technical committees (4)
- Assisting IPT to establish a nucleus in Rio Preto (São Paulo) to assist the small scale and medium scale furniture industries in the region
- Preparation of basic texts of priority standards in the area (10)

ELKE WOODWARD

Expert in metrology (electrical)

Period: 4 weeks (November - December 1986)

Job executed:
- Assist in organizing calibration services in the electrical field
- Training INMETRO personnel in actual calibration
- Development of manuals for calibration services
- Provision of documentation

UNIDO FELLOWSHIP - STUDY TOURS

Annex IV

Sr. Nº	Name	Period	Countries	Institutions	Objective
1	Adriano Braga Melo (INMETRO)	July 1983 15 days	Switzerland	GATT Secretariat	To understand working of GATT, Brazil's role in GATT and attend a meeting of GATT
2	Abel F. Fernandes (USIMINAS)	September 83 28 days	France, UK, Germany, Switzerland	National and international standards institutions AFNOR, BSI, DIN, ISO	To study system of standardization of equipments at national and international level, purchase specifications of equipments material and work as well as cost benefits analysis
3	Walmir Pinheiro de Araujo (INMETRO)	September 84 1 month	Switzerland	Landis-Gyr	To get trained in watt-hour principles, measurements errors, compensation of errors; trifastic kwh-meter of 3 and 4 wires; practical work; vectorial presentation; trifastic KVAL; employ watt-hour meter on transformers; watt-hour meter adjustment; time and parer method; energy method; adjustment methods; electromechanic and electronic basic information, automatic watt-hour control.
4	Ivan Marreiros da Costa (INMETRO)	September 84 1 month			
5	Ivan Mirra de Paula e Silva (university)	August 84 1 week	U S A	Demings Quality Assurance Course	To attend Q.A. course
6	Guido Ferolla (INMETRO)	November 84 38 days	Germany France Italy	Germany - PTB, Research Centre Volkswagen, Legal Metrology Centre, Hanovar, DIN and 4 others. France - National Bureau of Metrology, National testing laboratory, BIM, Thompson Co. Italy - Inst. of metrology	To study system of calibration services, inter-laboratory comparison tests, manufacture of standard reference materials

UNIDO FELLOWSHIP - STUDY TOURS (cont'd)

Sr. NP	Name	Period	Countries	Institutions	Objective
7	Kleber de Barros (IPT Franca)	October 86 1 month	Argentina	Technological Centre for Leather (CITEC)	To improve quality of leather, chemicals used, organization for standardization, and quality assurance
8	Claudio Loewenstein (INMETRO)	August 86 1 week	Austria Switzerland	UNIDO, GATT Secretariat, ISO and ITC	To acquaint with UNIDO understand working of GATT and discussing Brazilian situation, establish cooperation with International Trade Centre
9	Celso Carreiro Ildefonso (INMETRO)	October 86 3 weeks	Canada	CSA and SCC	Study Canadian metrication system
10	Guido Ferolla (INMETRO)	September 86 1 month	UK, Belgium, France, Italy, Switzerland	NPL, BCR, BWM, ISO	To study standard reference materials
11	Antonio Raimundo Coutinho Rebelo (IBQN)	November 86 1 month	U S A	1. Arkwright Boston Insurance Massachusetts 2. Indiana Vocational Technical College	Qualifying in certification to ASME and API codes