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ARGENTINE REPUBLIC

TECHNICAL ASSISTANCE TO UNDER-DEVELOPED COUNTRIES
A WAY OF ACTION

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INTRODUCTION

This paper presents the points of view of the author regarding the ways of actions by which technical assistance from developed to underdeveloped countries should be considered and applied.

Further to this it is explained how a technical entity devoted to give applied technical assistance in a middle developed country such as Argentina could be taken as an example of the thesis herewith stated.

1. The aims and activities of INTI and capacity to develop technologies applicable to the developing countries.

INTI is a decentralized (autonomous) organization established in the Secretaría de Estado de Desarrollo Industrial (Industrial Development Department) which is a Department of the National Economy Ministry. It has been created on December 27 of 1957.

1.1. Mission: Assistance to national industry through performance and promotion of research activities applied to obtain an optimum technical and economical development.

Improvement of the learning and training facilities , both technical and scientific, for industry personnel.

1.2. Activities:

- . Research and studies directed to develop better manufacturing and processing techniques for different raw materials and to develop a more extensive use of materials and raw products locally produced, or less expensive, and to raise the yield of available by - products.
- . Induce manufacturers to take steps in order to start these studies with the purpose of obtaining better products. To this INTI will favor the creation of research organizations together with the interested sectors.
- . To maintain strong links with all the country manufacturers, in a direct way, through their organizations.
- . To be in permanent contact with all the Argentine Universities and with official and private institutions devoted to research with the design of carefully following the course of their works and to support and collaborate with them in all the developments that would be of interest to industrial progress.

1.3. Capability to develop technologies apt to be applied in developing countries.

INTI has accumulated through its near 20 years of continuous work on industrial development, an amount of skill and experience that can be easily transferred to other developing countries.

This particularity applies to a great number of problems industry has to face in a underdeveloped country, this being the lot in a less or higher degree, of all the countries of the Latin American area. Solutions for this situation are more apt to be searched and to adapt them for any particular situation, from countries of similar structures and not from those enjoying very advanced technologies because prevailing conditions and parameters pertinent to these problems are in this case completely different.

In highly developed countries, solutions found are systematic and already present in their infrastructure (basic industries, components industries, specialized laboratories, technicians of all education levels, etc.) whence on the other hand, in developing countries it mostly happens to be necessary to build at the same time the lateral support or to look for emergency solutions. (see note).

Transfer of complex and sophisticated technology from an extremely developed country to another one scarcely developed is in general very difficult and even opposed to the objective because it produces higher dependency as needs arise which can not be locally met.

This is the reason why countries showing a medium industrial development can act as a very useful intermediate step, to digest and adequate very advanced

Notes:

In the case of industrial technology we can summarize the following differences between post-industrial and Latin-American countries:

1. Market size.
2. Qualified and unqualified workmanship cost in relation to automatic machinery cost.
3. Raw products and components availability.
4. Auxiliary and support services quality.
5. Mental attitude and language.

technologies before proceeding to their transfer to underdeveloped countries.

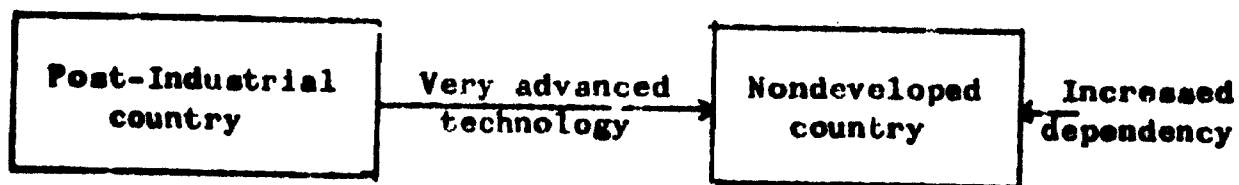


Fig. 1 - Incorrect technology transfer.

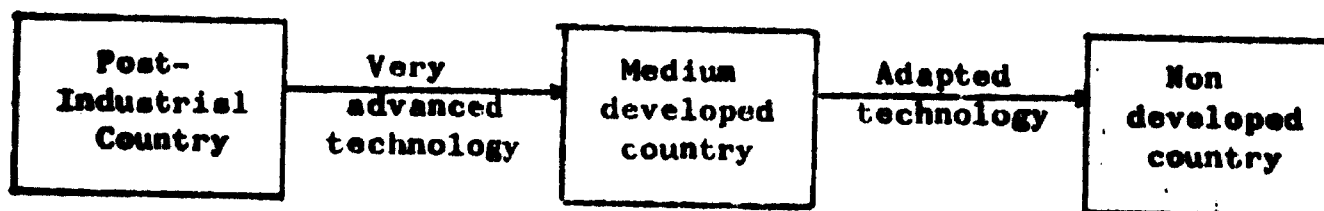


Fig. 2 - Correct technology transfer.

A good example of this second type of transfer is INTI (Argentina) - P.T.B. (Germany) agreement on metrology matters. Transferred technology to INTI is at present spread to many Latin-American countries by means of regular courses taking place at INTI's Laboratories.

2. INTI's manpower and financial resources (present and planned).

2.1. Acting personnel:

University graduates	260
Technicians	407
Administrative staff	<u>345</u>
Total	1012

Planned rate of growth (annual): 8 %

2.2. Financial Resources:

The funds necessary for INTI's activities are obtained through a 0,25 % contribution deducted from all the loans granted to industrial enterprises by all the Argentina's Banks, to which are added the income from fees for services rendered.

Total income for 1976 year is estimated in u\$s 8.000.000 and the average rate of growth (in constant money value) is 6 %.

2.3. Operating laboratories.

Premises area	20,000 m ²
Estimate of instruments, equipment and buildings.	US \$ 100 millions
Available ground area	15 Hm ²

3. Description of present and planned activities.

INTI's organization is based on a Central Laboratories group of polytechnic character and on a group of Research Centres. Almost all these Research Centres have their own Laboratories and the required number of professionals to carry out the centre programmes and services.

The centres operate on the basis of collaboration agreements between INTI and the different types of interested industries, manufacturers, Professional Chambers, Research Institutes and Universities.

3.1. Central Laboratories:

They are located on the periphery of Buenos Aires - Argentina's Capital.

- 3.1.1. Metrology :
 - 3.1.1.1. Mechanical
 - 3.1.1.2. Electrical
 - 3.1.1.3. Electronics
 - 3.1.1.4. Heat
 - 3.1.1.5. Acoustics
 - 3.1.1.6. Optics
- 3.1.2. Chemistry :
 - 3.1.2.1. Analytic
 - 3.1.2.2. Instrumental
 - 3.1.2.3. Applied
- 3.1.3. Construction:
 - 3.1.3.1. Materials
 - 3.1.3.2. Structures
 - 3.1.3.3. Habitability
- 3.1.4. Mechanics :
 - 3.1.4.1. Fracture and Fatigue
 - 3.1.4.2. Non Destructive tests

- 3.5.1.2. Certified control of industrial parts dimensions.
 - 3.5.1.3. Physical properties (optical, acoustical, mechanical, thermal) of materials and products.
 - 3.5.2. Construction; Certified quality control of materials and structures (civil construction, dams, bridges, etc.)
 - 3.5.3. Non destructive mechanical testings.
 - 3.5.4. Technical advice and assistance in the industrial areas covered by the Research Centres.
- 4. Activities in foreign countries and joint action in collaboration with other local or foreign institutions:**
- 4.1. INTI experts in foreign countries
 - 4.1.1. Mechanical Metrology (Panamá)
 - 4.1.2. General Metrology (Uruguay)
 - 4.1.3. General Metrology (Bolivia)
 - 4.2. INTI training courses for foreigners
 - 4.2.1. Metrology course sponsored by OEA attended by 17 post-graduates from 10 Latinamerican countries (with OEA fellowships).
 - 4.3. Collaboration agreements with other countries
 - 4.3.1. INTI-PTB (Physikalisch-Technisches Bundesanstalt, Germany) for assistance in metrology.
 - 4.3.2. INTI-INTN (Paraguayan Institute for Technology and Standardization) aiming to give technical assistance in the construction of the bi-national project of Yaciretá dam, located on the Parana River.
 - 4.3.3. INTI-LATU (Technological Uruguayan Laboratories) for technical assistance
 - 4.4. Collaboration with Argentine Institutes

INTI acts in very close association with many Research Centres of our country. Some of them are:

 - 4.4.1. National Council on Science and Technique (CONICET)

- 4.4.2. Research Institute of the Armed Forces (CITEFA)
- 4.4.3. National Commission of Atomic Energy (CNEA)
- 4.4.4. National Commission for Geoheli-physical Studies (CNEGH)
- 4.4.5. National Institute of Agrarian Technology (INTA)
- 4.4.6. National and private Universities

5. Problems faced in the development and transfer of Technology

5.1. INTI, notwithstanding its 20 years existence, may be considered still in the growth and consolidation stage of its possibilities.

As a consequence, its capability in relation to technology production has not yet arrived to the optimum degree of maturity and adjustment, mainly due to the very wide ranging changes which occurred in Argentina's economy trends and levels.

It is necessary to consider the different levels of technology that are under INTI's management.

- 5.1.1. Technology already mastered in foreign countries which is absorbed without any modification to be applied in Argentina.
- 5.1.2. Technology generated abroad and that has been subject to some modifications in order to adapt it to the local prevailing conditions.
- 5.1.3. Technology totally or partly new in the industrial world, and that has been developed in INTI's system.

INTI's main activity is centred in the two preceding items, but possibly the second one (5.1.2.) is the most important.

As to item 5.1.3. we may say that only a few examples can be shown which took place recently. Nevertheless it is estimated that this item will acquire in the near future a significant proportion in relation to the whole.

Technology transfer according to 5.1.1. and 5.1.2. items, follow well known mechanism, but the case is different with 5.1.3. item where more problems arise in technology transfer.

- 5.2. Technology transfer from INTI to industrial users, is accomplished through various channels.
- 5.2.1. Technical services (Analysis, certifications)
 - 5.2.2. Advisory services (Question-answer services, sending of experts, etc.)
 - 5.2.3. Information services (Publication of technical papers, standards, catalogues, etc.)
 - 5.2.4. Training services (courses, technical training, teaching on analysis methods, etc.)
 - 5.2.5. Production of standards and specifications.
 - 5.2.6. Supplying new technologies for industrial processes by means of specific agreements relative to development between INTI and industrial concerns.
 - 5.2.7. Delivering technology spontaneously developed in INTI either protected or not by patents.

Transfer process is rather simple in the six first listed situations (5.2.1. to 5.2.6. items). In the case described by 5.2.7. item, which applies to technologies partly or wholly new (5.1.3. item), the experience gathered is limited.

As delivery of the new technology involves a case of economic grant, all the proceeding shall be subject to a definite contract stating all the obligations accruing to the receiver of the new technology (Royalties' payment, obligation to put it into operation, etc.) and on the other hand it must contain provisions protecting him against different eventual situations (customs' protection, exclusiveness, etc.)

This type of agreements is not been implemented yet but it is considered that they shall be sufficiently flexible in order to cover all the special situations that may eventually appear.

Particular attention is being given to this problem at present in our organization.

- 5.3. Problems to be faced in technology generation.
We may list:

- 5.3.1. Difficulty to compete with private industry, whenever the need of hiring the more capable technicians arises.
 - 5.3.2. High price of research equipment and instruments.
 - 5.3.3. Deficiency of national coordination in the area of Research and Development.
 - 5.3.4. Lack of interest, in the local branches of foreign concerns to develop technologies in Argentina.
 - 5.3.5. Shortage of economic power in some national enterprises to permit them to face technological developments.
- 5.4. It will be necessary, as a contribution to solve these problems:
- 5.4.1. To attain the necessary independence to conduct the Research Institutes, aiming at their maximum efficiency and the best use of the available funds.
 - 5.4.2. To obtain by means of adequate publicity campaigns maximum collaboration from the industrial sector.
 - 5.4.3. To increase the number of international technical collaboration agreements.
 - 5.4.4. To attain the required and necessary national coordination of the Research and Development plans.
6. Co-operation among research institutions.
- 6.1. As a very important experience on the subject of international collaboration, the INTI (Argentina) - P.T.B. (Germany) agreement can be put as a good example. This agreement developed in Argentina an excellent technological capacity in the metrology area which at present is transferred to many Latin-American countries by means of courses sponsored by OEA and being taught at INTI's premises. The attendants were post-graduates of 10 Latin-American countries who had been awarded fellowships by OEA.

6.2. Another example that deserves being mentioned is the new agreement INTI (Argentina) - INTN (Paraguay) which aims to assist, in a joint operation by the two Republics, the construction of the great bi-national dam of Yaciretá, on the Parana River.

7. Possible areas of joint research.

INTI being the Technology Institute of a country of medium industrial development, can offer two different type of Research and Development Agreements; one, with organizations belonging to highly developed countries with the purpose to increase its own capacity, and the other with entities from countries of similar or even lesser stage of development with whom INTI can accomplish cooperative developments or technology transfers.

7.1. The areas in which INTI would be interested in getting technology from outside:

7.1.1. Metrology : increasing the existent capacities.

7.1.2. Food Industry : 7.1.2.1. Milk processing
7.1.2.2. Meat processing

7.1.3. Electronic Industry

7.2. The following are areas where INTI is able to transfer technology and basic knowledge.

7.2.1. Minerals : 7.2.1.1. Processing, preparation, or beneficiation

7.2.2. Materials

Research : 7.2.2.1. Cast iron

7.2.2.2. Improved cast iron quality through remelting under electroconductive slag

7.2.2.3. Heat-treatment in general

7.2.2.4. Mechanical properties of metallic materials

7.2.2.5. Analytical Chemistry (metals and minerals)

7.2.2.6. Metallography

7.2.2.7. Mechanization workshop and devices design and manufacture

7.2.3. Leather

Technology : 7.2.3.1. Tanning processes and operation.

7.2.3.2. Industrial wastes disposal.

7.2.3.3. Leather finishing.

7.2.3.4. Chemical Analysis of leather.

7.2.3.5. Leather Physical and mechanical tests.

7.2.3.6. Skins and leather microscopy.

7.2.3.7. Tanning pilot plant for experimental purposes and skins and leather laboratory.

7.2.3.8. Standardization of leather and its manufactured goods .

7.2.4. Dairy

Industry : 7.2.4.1. Chemical, Physico-chemical and Bacteriological analysis of milk and dairy products.

7.2.4.2. Sweet of milk and sugar boiled until desired consistency (similar to butterscotch)

7.2.4.3. Chromatography and Electrophoresis techniques.

7.2.4.4. Instrumental analysis techniques.

7.2.4.5. Technical survey of dairy industry.

7.2.4.6. Drafting and evaluation of plans for teaching and training in dairy industries techniques.

7.2.5. Fruit and

vegetables: 7.2.5.1. Food preservation industry (Fruit and vegetables canning in hermetically sealed containers heat sterilized. Analytical and quality control).

7.2.5.2. Waste water treatment of the industry in the items above.

7.2.6. Marine Biology

7.2.6.1. Ecology, systematics, and culture of benthonic organisms.

7.2.6.2. Zooplankton.

7.2.6.3. Marine organisms (algae chemistry).

7.2.7. Environmental Engineering:

7.2.7.1. Health care for industrial workers programs.

7.2.7.2. Gaseous effluents treatment.

7.2.8. Acoustics and Illuminating techniques research

7.2.8.1. Acoustics in buildings

7.2.8.2. Noise control.

7.2.9. Textile technology

7.2.9.1. Project, organization and starting of quality control laboratories.

7.2.9.2. Teaching and training of technicians for quality control laboratories.

7.2.9.3. Applied research planning for;


- wool and/or cotton spinning mills.

- weaving factory for knit work.

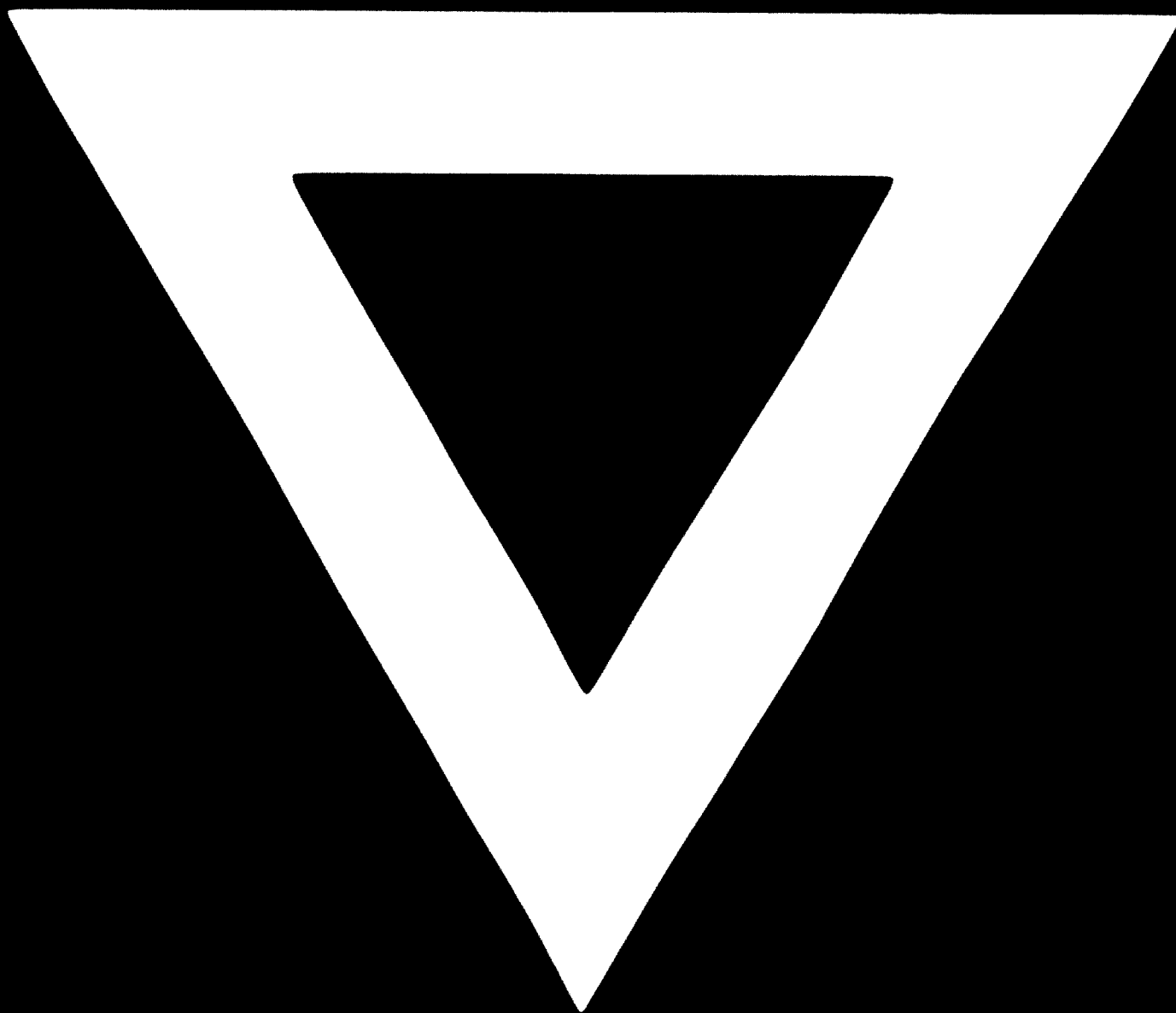
- shuttle weaving factory.

- hand work.

- 7.2.10. Construction materials** : 7.2.10.1. Analytical chemistry; instrumental analysis.
7.2.10.2. Organization and starting of laboratories.
7.2.10.3. Cement analysis and tests.
- 7.2.11. Food technology** : 7.2.11.1. Use of instrumental techniques in oily and fatty products and in plant proteins.
- 7.2.12. Metallurgy** : 7.2.12.1. Mechanical testing of metals.
7.2.12.2. Ferrous and non-ferrous metals metallography.
7.2.12.3. Surface coatings testing and evaluation.
7.2.12.4. Welding: techniques, evaluation and control.
- 7.2.13. Mechanics** : 7.2.13.1. Non destructive testing of metal.
7.2.13.2. Fatigue testing.
7.2.13.3. Design analysis of mechanical and structural components.
7.2.13.4. Failure in operation analysis.
- 7.2.14. Physics** : 7.2.14.1. Metrology: fundamental and industrial in the following areas:
. mechanics
. electricity
. electronics
. heat
. optics, colorimetry and radiometry
. acoustics
- 7.2.15. Applied Electro-chemistry** : 7.2.15.1. Corrosion

- 7.2.15.2. Metals finishing
 - 7.2.15.3. Modern electrochemical techniques. Cyclic Voltametry. Chronopotentiometry. Pulses, etc.
 - 7.2.15.4. Electronics instrumentation for electrochemical process control.
 - 7.2.16. Construction:
 - 7.2.16.1. Structural resistance analysis in construction
 - 7.2.16.2. Building materials technology.
 - 7.2.16.3. Theoretical and experimental Analysis of hygrothermal problems.
 - 7.2.16.4. Study of building components adequacy.
 - 7.2.17. Chemistry :
 - 7.2.17.1. Design, installation, equipment, extension, and/or updating, of applied or instrumental Analytical Chemistry Laboratories.
 - 7.2.18. Thermodynamics
 - 7.2.18.1. Use of products, by-products, and plant residual for thermal energy production in boilers.
 - 7.2.18.2. Use of low quality coal for thermal energy production in boilers.
 - 7.2.18.3. Water treatment for low-pressure boilers.
 - 7.2.19. Cellulose and paper technology :
 - 7.2.19.1. Studies on fast growing forestal raw materials (Poplars, willows, eucalyptus and pines) to obtain cellulose pulps and for paper making.
 - 7.2.19.2. Paper manufacture process namely for newsprint using short fiber wood (willows and poplars) or sugar cane bagasse pulp.
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