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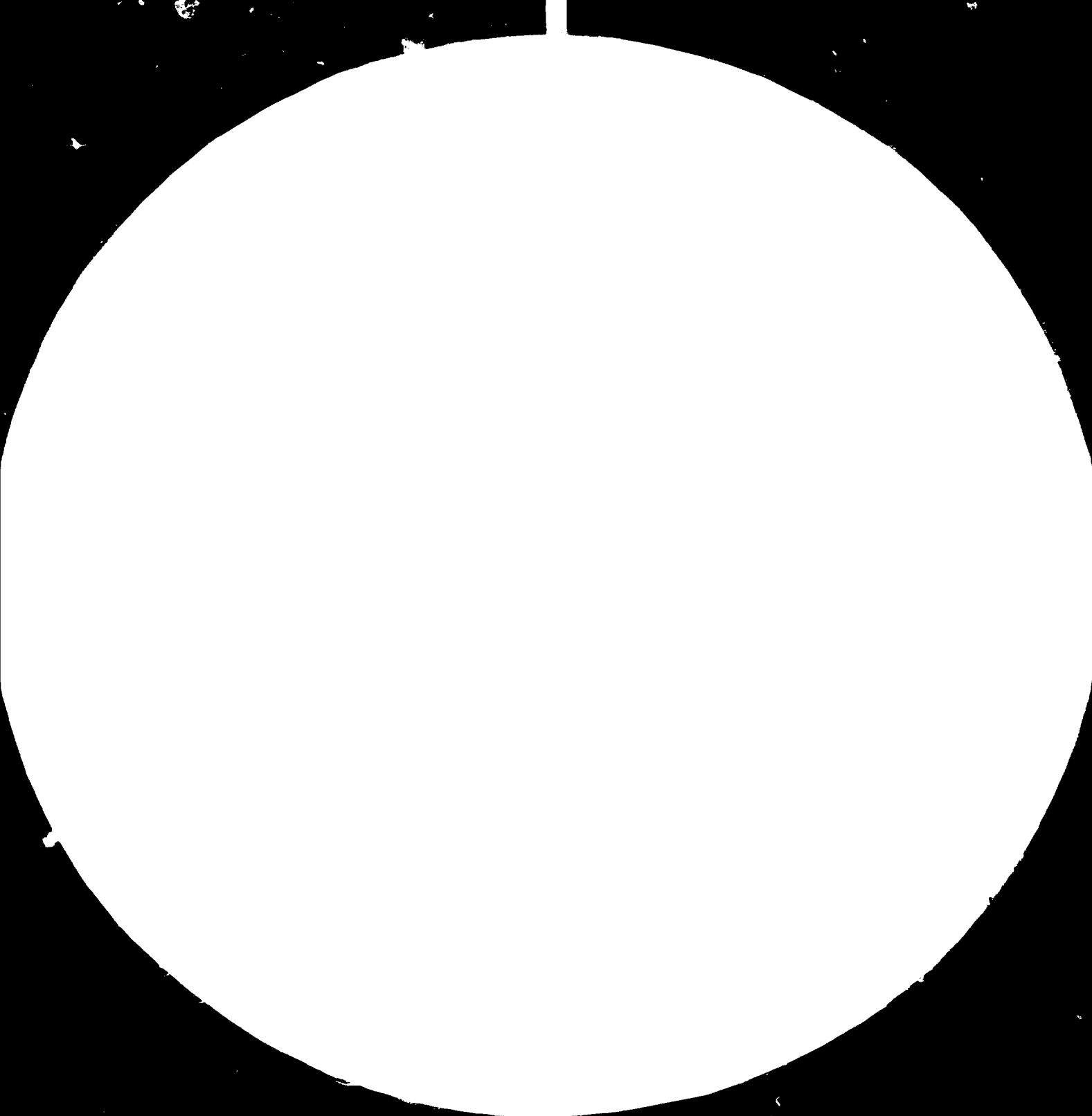

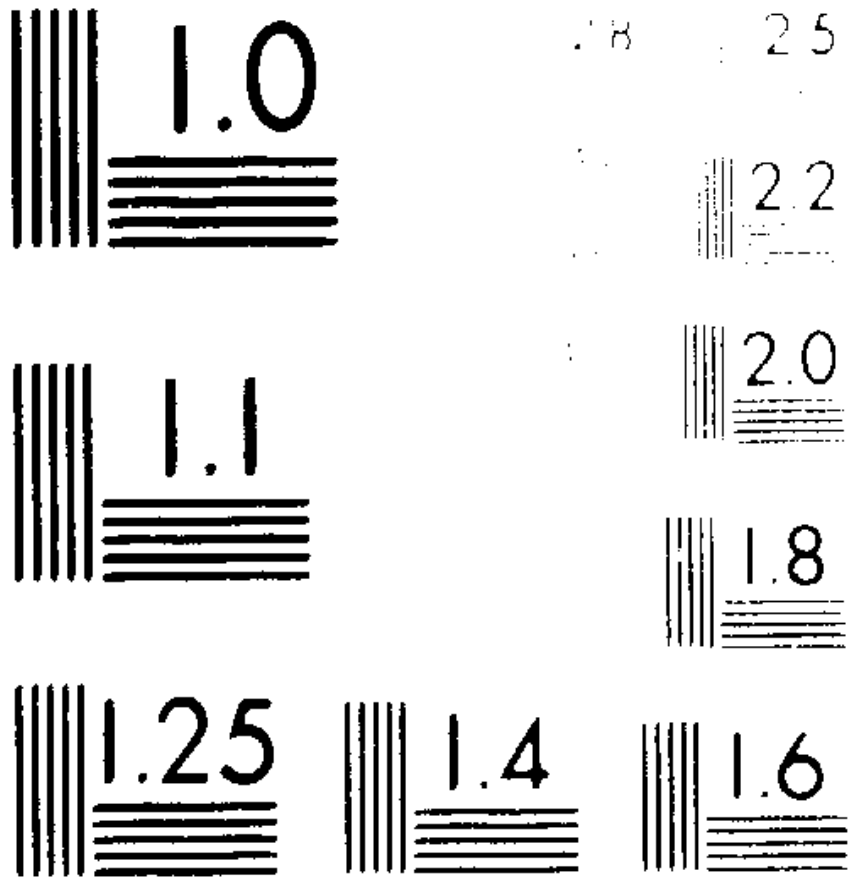
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ASSISTANCE TO THE
INSTITUTO DE INVESTIGACIONES TECNOLÓGICAS
(INTEC-CHILE)

SI/CHI/82/801

CHILE

Terminal report: Maximizing INTEC-CHILE's techno-economic contributions to the country*

Prepared for the Government of Chile
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Rich H. Westergaard and James P. Blackledge,**
industrial research and organization experts

United Nations Industrial Development Organization
Vienna

* This document has been reproduced without formal editing.

** Documents DP/ID/SER.A/410 and DP/ID/SER.A/411 also refer.

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RESEARCH TERMINOLOGY

Below, some terms used in the report are explained. The term RESEARCH relates to INDUSTRIAL RESEARCH, without saying so all the time.

1. IRSI = Industrial Research and Service Institute

INTEC is an IRSI.

RESEARCH means acquiring new knowledge by laboratory experiments and/or theoretical investigations.

SERVICES means application of existing knowledge: Engineering, testing and analysis, surveys, feasibility studies, etc.

The distinction between research and services is not very clear, some projects have a high content of research, others have little.

2. R + D = Research and Development

RESEARCH means experiments, etc, needed to create a new or improved technology.

DEVELOPMENT is short for process or product development, such as: engineering, pilot plant studies, design and establishment of production.

3. DEVELOPMENT, in general means: advancement, improvement, increased gross national income, etc, and must not be confused with the definition used in the term R + D.

4. BASIC AND SCIENTIFIC RESEARCH, is in principle not industrial research. It aims at discovering new phenomena and to shed light on the laws of nature without having specific uses of the knowledge as the motive.

5. APPLIED RESEARCH is research aimed at achieving a useful result which can be exploited.

APPLIED RESEARCH can have a high content of advanced research, using the same methods as in basic research - or it can be more related to engineering, product development or desk work and field surveys.

Sometimes it is called "research" when done in an IRSI, and something else if done by the user of the results.

6. SHORT TERM, TACTICAL RESEARCH aims at solving specific problems for a client, who ought to be motivated to pay the full cost. The client can be a private enterprise or a public enterprise or agency.

7. LONG TERM, STRATEGIC RESEARCH aims at solving larger more fundamental problems and to create a preparedness to meet the future. Sometimes the beneficiary is an enterprise, sometimes a branch. When no particular beneficiary can be clearly identified, the beneficiary may be said to be the Nation. Strategic research has a higher economic risk and a longer payback time and is usually financed, at least in part, by the Government to promote and stimulate industrial development.

8. GOVERNMENT FINANCED PROJECTS (GRANTS). Such projects tend to be strategic rather than tactical. They can most often be termed applied, but may be more long-term and less specific in nature. They are funded by government for one or several of the following reasons:

- Strengthen the capability of an IRSI.
- Establish new national capabilities in science and technology.
- Prepare the ground for technology transfer.
- Develop natural resources.
- Spearhead and stimulate development of technologies believed to have a good potential.
- Occasionally to help an R + D project based on a good idea, and believed to have a good potential, but unable to find a financial sponsor.

9. ECONOMIC PLATFORM FOR AN IRSI. An IRSI can only charge its clients for work which benefits them directly, but the IRSI needs money also for:

- Its establishment.
- Its maintenance and growth.
- Internal projects to develop skills, test new ideas and to prepare the ground for new client-financed projects.

The platform money usually comes from government; sometimes from a foundation.

10. IRSI AUTO-FINANCING. The percentage of the budget collected from clients and government grants constitute the degree of self-financing (on the assumption that government grants are justified by expected results rather than being disguised subvention). The degree of auto-financing varies considerably from one IRSI to another. Auto-financing is easier for mono-branch institutes

and if the research is of a short-term nature. Auto-financing beyond, say 70%, indicates that strategic research is neglected and that the IRSI is over-exploiting its human and physical resources, because the economic platform is insufficient. Auto-financing is a yardstick of efficiency but not necessarily of national benefit.

11. RESEARCH SUBSIDIZING. Some countries, particularly the less developed, subsidize the IRSI so that it can sell its services for less than actual cost, or even give it for free. Chile is too advanced for doing that, but may promote research in the private sector by sharing the cost for "high-risk-good-potential-projects". Often this is done in the form of government grants to projects promoted by an enterprise jointly with an IRSI. This is most common in smaller capitalist developed countries. The motive can also be to stimulate the development of a less developed region or to create employment (social benefits).

12. IN-HOUSE RESEARCH. Projects defined and executed by the IRSI without external control. They are financed from the platform money.

13. MONO-BRANCH IRSI. Is one serving a particular branch, like pulp and paper, metallurgy, leather or textile industry.

14. MULTI-BRANCH. (Multi-discipline, multi-purpose). IRSIs serve any branch. They are less specialized, more generalized than the mono-branch IRSI.

INTEC IS A MULTI-BRANCH INSTITUTE.

A. FOREWORD

This report and analysis is based on independent evaluations by two consultants who separately met with INTEC-CHILE staff members and representatives of CORFO, the Government, and the productive sectors. Each consultant prepared a report which has been submitted to UNIDO in English only.

Since no representative from Chile was present in Vienna when the report was prepared, the version of 19 November was a draft. During the two first days in Chile during the second mission, the report was finalized with some additions and corrections. With these changes, the report was frozen. Views, facts and recommendations resulting from the various meetings held during the two week missions will be presented in a separate field mission report.

The status of INTEC, its mode of financing and its relationship with other institutes, universities and government agencies are interrelated in the system. Needs for changes in the system not mentioned explicitly in the report will certainly become apparent in the process of improving INTEC's position. It was not possible within the time available, for the consultants to analyze a possible need for infrastructural changes in Chile's science and technology system. In the field report of Mr Rich H. Westergaard, after his first visit, there is information on a Norwegian exercise, evaluating the Norwegian Industrial Research System and suggesting changes: a similar project may be considered for Chile, possibly with UNIDO assistance.

As the consultants have had limited time to study the total S/T system in Chile, the report contains only a few specific recommendations. Its main objective is to present a tool to be used by the appropriate authorities when making their decisions about INTEC.

B. EXECUTIVE SUMMARY

CONCLUSIONS AND RECOMMENDATIONS

(i) INTEC-CHILE is a successful research institute. Presently, it is of considerable national value and has a great long-range potential. It should therefore be supported under conditions which will enable it to survive the present crisis. This includes changing the legal status of INTEC-CHILE to a private law corporation.

(ii) To keep INTEC-CHILE viable, means of financing beyond fees collected from clients must be found.

(iii) Mechanisms should be created for co-operation between INTEC-CHILE, Fundación Chile and the University of Chile, and proper distribution of the activities. In this way they can all become more useful to the country; INTEC-CHILE can more easily reach a high degree of self-financing and raise its standards.

I. INTEC-CHILE is a successful Research Institute

The two consultants independently found that INTEC-CHILE is mature and efficient. The staff is well-educated and dedicated, and the administration is excellent. Marketing activities of the institute are dynamic and contribute significantly to the ability of INTEC-CHILE to compete successfully with other research institutes who currently operate under more favourable conditions. The institute provides important services at competitive prices and has also developed some new and valuable processes. Compared to most industrial research institutes in developing countries, INTEC-CHILE is one of the best. INTEC-CHILE is, even by the standards of industrialized countries, a very good institute.

II. INTEC-CHILE has serious financial problems and is in danger of collapsing

INTEC-CHILE is requested to be self-financing but is unable to obtain enough projects and charge high enough fees to cover:

- direct expenses;
- administration and overhead;
- costs of maintaining and expanding its capabilities.

Competition from institutions having access to sources of income in addition to projects and the economic recession in Chile, have aggravated the situation. CORFO will no longer be able to assume the institute's budgetary deficit.

INTEC-CHILE is now in danger of collapsing financially. It is laying off staff and many of the groups are already below a critical size; equipment is becoming obsolete and worn out. The staff has very little opportunity to develop new skills.

III. Chile has great potential and needs industrial research to develop the national resources and create work for its people

Chile's potential is excellent for exploitation of:

- Natural resources: Copper and other minerals, good land and climate for agriculture, forestry, fishing, oil, hydro-electric power, and a beautiful country for tourism.
- Human resources: Homogenous population, very well-educated people, dedicated and hard-working, and with high morals.

Industrial research can do for Chile what it has done for many other countries:

- create engineers and scientists capable of handling demanding projects;
- assist in creating independent national industrial enterprises;
- strengthen the competitiveness of industry;
- promote transfer of technology;
- identify business opportunities.

The success of countries like Norway (which supplies 80 per cent of the inputs to its growing off-shore oil industry), Japan (which imported technology and improved it by its own research), Singapore (which developed high-technology industries and skilled human resources to become a leader in exports of quality products), and Brazil (which has exploited its own natural resources), could not have been achieved without putting a considerable amount of government money into industrial research.

The present buyers market situation for research services must be assumed to be temporary. Actually, the total national research capacity is modest considering Chile's economic potential. If the Government believes in a bright future for Chile, means must be found to make INTEC-CHILE survive the present crisis. If INTEC-CHILE is allowed to collapse, it will be very difficult and will take a long time to revive it or a similar institute.

IV. Means must be found to finance INTEC-CHILE

Multi-purpose, multi-disciplinary, multi-branch industrial research institutes are needed, in addition to branch institutes, to fill in the gap and to do the more sophisticated and future-oriented research. The experience from less developed countries is that governments pay most of the costs (80 - 90%). In the more developed countries they are more self-financed, but still require some government assistance.

1. Work contracted by clients

The clients can be private or public enterprises, and government or other public agencies. In developed countries the fee, including overhead, covers the full cost and even a small profit. In developing countries these projects are more or less subsidized by the governments.

Contracted projects usually provide 30 - 70% of the budget in less developed countries.

2. Research contracts financed by the Government (grants)

a. In order to promote industrial development, most countries have a body which gives research grants.

b. Projects addressing problems common to several enterprises, stimulating improvements and innovations.

c. Many countries have had great success with research projects jointly financed by government and industry. The purpose is to encourage projects with good potential but high economic risk.

d. Some government-financed projects are motivated by the expected social benefits (better environment, more employment, etc).

Government grants may cover 30 - 50% of the institute's budget. The more developed countries have a better machinery for setting priorities and for administration of research grants. Less developed countries must depend more on the research institutes to select projects financed by their budget money (see section 3 below).

3. Stable financial platform

Practically all research institutes need a stable financial platform to finance:

- in-house research projects aimed at creating large-scale externally-financed projects;
- acquisition of new skills and capabilities;
- renewal of obsolete equipment;
- training of staff.

In developed countries, this financial platform normally amounts to 10 - 30% of the total budget; 50 - 90% in the least developed countries.

INTEC-CHILE does not have this financial platform and there is an urgent need to find a solution. There may be several alternatives for providing the money.

- The money can come from the Government (CORFO, CONICYT, etc).
- A research association of potential clients paying a fee and having certain advantages (multi-client centres).
- The profit from a football pool could be earmarked for research (as was done in Norway).
- Make the fees so high that they cover also these expenses, but at present, with the buyers market as it is, this is unrealistic.
- Some kind of a levy tax.

For 1983, the only alternative seems to be that the Government provides financial support to budgetary deficits.

V. A new legal status can improve the situation for INTEC-CHILE

INTEC-CHILE is a committee of CORFO at the present time, however, as a result of recent Government directives, CORFO can no longer provide funds to INTEC-CHILE to improve the institute's facilities, retain staff and up-grade staff competence.

Contracts to INTEC-CHILE from CORFO must, in the future, be approved by ODEPLAN and awarded on a competitive-bid basis. As a CORFO committee, INTEC-CHILE is not eligible to receive project grants from CONICYT under DFL No. 33, 15 September 1981.

It is necessary that INTEC-CHILE be given a new legal status so that the institute will be eligible for CONICYT money and to contract with other Government-funding sources.

VI. Bureaucratic procedures must be avoided

A central organization can never be staffed with sufficiently capable people to execute detailed guidance and control of industrial research. Industrial and public clients should provide guidance in the order of 70 - 80% of the activities.

The state (in consultation with the users) should control the rest, identify long-term goals and initiate larger research programmes. Even in highly industrialized countries, central bureaucratic control is difficult. In less developed countries, it is even more difficult.

The use of INTEC-CHILE's financial platform money should not be dictated by the State but used by INTEC-CHILE and its board according to a budget and appraisal at the end of each year.

The processing of INTEC-CHILE's budgets and handling of applications for research grants must not take more than 6 - 7 months. If it takes longer, it will prevent the institute from having a fast and dynamic response to the market opportunities.

Annually up-graded five-year plans are recommended in order to improve the planning, particularly of large projects and programmes of a duration of more than one year.

VII. Foundation Chile's mode of operation should be changed

With the present mode of operation, Foundation Chile constrains INTEC-CHILE as well as other national research institutes:

- it undertakes projects which INTEC-CHILE should conduct;
- it blocks new fields of activities in INTEC-CHILE;
- both Foundation Chile and INTEC-CHILE have groups in the same fields, each of which is of sub-critical size;
- Foundation Chile exerts pressure on the price of INTEC-CHILE services to below market value.

Foundation Chile could be more useful if it would stop competing with national research institutes and avoid activities which can be successfully undertaken by these institutes.

Foundation Chile should concentrate on technology transfer (specialized information services, feasibility studies requiring international expertise, seminars, training, and expert services). It should expand its marketing activities, identify research and development projects, recommend them to INTEC-CHILE and others and supervise the projects.

Foundation Chile is today, only to a small extent, self-financed. It has the potential to promote developments which, in the long term, may prove to be very useful. If it is pressured to be more self-financing and continues to invade the market of INTEC-CHILE and others, it will destroy them and after a while may find itself in a position similar to INTEC-CHILE.

VIII. INTEC-CHILE should co-ordinate its activities with the University of Chile

Three alternatives have been considered:

- Increased co-operation and co-ordination on an informal basis.

- Merger between INTEC-CHILE and certain departments of the University of Chile to form a new corporation.

- Create a co-operation unit with common services.

It will require further investigations and negotiations to find the best solution and to implement it. UNIDO assistance can be considered.

C. ANALYSIS OF THE SITUATION

IX. Purpose of the UNIDO assistance project

The Government of Chile wants the country's research institutes to be self-financing. This requirement, together with the economic crisis and some other unfavourable conditions, has caused an acute crisis for INTEC-CHILE.

The purpose of the UNIDO mission is to assess the national usefulness of INTEC-CHILE and propose adequate measures to secure maximum national benefit from its activities and services.

X. INTEC-CHILE objectives and history*

INTEC-CHILE was created in 1968, as one of several R + D organizations created by CORFO, the Chilean Development Corporation (Corporación de Fomento de la Producción) in meeting one of its three mandates to stimulate development of the productive sector of the country, viz: "support of R + D programmes and studies specifically intended to be used by private investors, as well as to undertake R + D programmes of interest and importance to the economic development of the country, but which would not be undertaken by individual enterprises" (e.g. natural resource development).

INTEC-CHILE was created as a result of awareness, by the Government, of the following:

a. Inability of university applied research workers to solve, in a fixed time-frame and for a pre-determined cost, those technological problems confronting productive enterprises;

b. The urgent need for adapted or transferred technologies by the productive sectors to survive in the market-place and to achieve economic growth;

c. The factor of size of national industries, which has not permitted maintaining private centres for R + D in each business, but which through the aggregation of similar need, could sustain R + D activities of growing importance;

d. The necessity for confidentiality for research results, which the university systems have no capability to guarantee.

The mandate which created INTEC-CHILE stated that the institute, as an entity of CORFO, was designated to give support to industry, public and private enterprises and to CORFO, in all related aspects to create, introduce,

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* Extracted from "El Rol Subsidiario del Estado en la Investigación y el Desarrollo, INTEC-CHILE Marzo 1982".

adapt, or substitute technologies by means of utilization of technological information, the transfer of technology, and/or experimental development in INTEC-CHILE's laboratories and pilot plants.

In 1968, Government policy favoured the execution of such R + D in an institution which would be owned and managed by the Government. However, the INTEC-CHILE constitution stated that the institute would be obligated to provide R + D and technological services by means of contracts with clients and through financing by users. It was stated clearly from the beginning that the financial support of the Government, exercised through CORFO, would consist solely of:

- financing of initial investments;
- initial support of projects to enterprises.

It was believed that "signals" received from the market-place for technological services required, could be used to adequately determine the appropriate size of INTEC-CHILE.

During the period 1970 - 1973, as a result of a significant change in the Government of Chile, INTEC-CHILE was transformed into a totally State-supported institution. The concept of contracts with clients and private financing for services was eliminated in accordance with Government policies. By the end of 1973, the INTEC-CHILE staff numbered 333, with 101 professionals.

During the period 1974 - 1979, INTEC-CHILE began t[illegible] to the operational mode which had been specified in the establishment of the institute. This re-orientation occurred gradually, in order to preserve the positive aspects of INTEC-CHILE's ability to assist in the transformation of the industrial sector, but also to comply with Government directives to reduce the size of the public sector and to work towards self-support.

At the end of 1979, the INTEC-CHILE staff had been reduced, in accordance with the above, to a total of 146, of whom 66 were professionals. During the period 1974 - 1979, contracts for services to clients (Government ministries and entities, public and private productive sectors, international organizations, and CORFO) increased from US$696,000 (1974) to US$4,665,000 (1979), while the annual CORFO contribution decreased from US$4,054,000 (1974) to zero in 1979.

During the period 1980 - 1981, INTEC-CHILE made further adjustments in its operations in order to achieve financial equilibrium. The institute continued seeking mechanisms to achieve a stable situation, to more clearly define the market for services outside of CORFO, to improve its capabilities, and to possibly re-structure INTEC-CHILE or to merge with another institution.

Contracted services income declined during this period, partly as a result of the effects of the deepening world-wide recession, as well as from a change in government policies. The INTEC-CHILE staff at the end of 1981 numbered 108, of which 44 were professionals. It seems clear that, at this point, INTEC-CHILE was beginning to fall below the critical size necessary to provide effective services. During this period, INTEC-CHILE shifted emphasis to providing principally technical services, with less effort in R + D. This shift in emphasis took place as a result of full awareness of the current needs of present and potential INTEC-CHILE clients, as well as to recognition that the institute, in an era of declining Government support, could not always compete for R + D projects against university applied research groups and other Chilean institutes which continue to receive subsidies or income from other than contracted services for clients.

As a result of studies in 1980 of the market for R + D and technological services, and an analysis of financial resources for R + D prepared by CONICYT (Comisión Nacional de Investigación Científica y Technológica), INTEC-CHILE reached the following general conclusions:

a. Considering all types of scientific investigations and technology, the Government has been financing nearly 75 per cent of the total annual costs of such activities;*

b. The Government, during the period 1974 - 1981, financed the majority of such R + D activities via contributions, and to a lesser extent through buying of services. The mechanism of granting direct subsidy to an activity was not used significantly during this period;

c. In general, the Government did not achieve a clear separation, in those institutions and organizations to which it made contributions, between the function of financing and the function of execution of projects. The reason for this has not been made clear in economic evaluations, and the lack of such control makes viable indiscriminate subsidies which appear to favour those institutions without auto-financing;

d. In the case of INTEC-CHILE, by the end of 1979, the institute had separated clearly the functions of finance and project execution, and had achieved an equilibrium of auto-financing;

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* This is not an unusual percentage of R + D support, even in countries such as the United States, and is often very much higher in most developing countries.

e. INTEC-CHILE provides approximately one-third of the national technological services in the areas of specialization which it provides;

f. It has been observed, based on results between 1979 and 1981, that INTEC-CHILE needs to revert to a market sustained by CORFO in the amount of approximately 50 per cent of the institute's annual budget;

g. INTEC-CHILE has arrived at the smallest critical size viable if it is to guarantee its ability to perform tasks at an equitable price to its clients.

The above analysis by INTEC-CHILE is considered by the consultants to be realistic, and represents an awareness by the institute of the environment in which it, and other technological institutes in Chile, exist. It seems clear that the private sector has little interest in assuming a major funding responsibility in R + D, and will limit its support to buying technological services which are necessary at levels clearly below those of the period 1979 - 1981. It seems equally clear that the Government must continue support of areas of R + D through contributions, or contracts, or both.

XI. Analysis of INTEC-CHILE's operations

As mentioned earlier, INTEC-CHILE's mandate stated, in effect, that the institute was intended to function as a multiple purpose, multi-sector Industrial Research and Services Institute, in UNIDO called IRSI.

The areas in which INTEC-CHILE provides technological services are the following:

- Techno-economic studies and technology transfer;
- Projects in various industries;
- Food and agro-industries;
- Chemical and metallurgical industries.

1. INTEC-CHILE administration

The institute's administration has been reduced to the minimum necessary to continue operations. Its director and senior professional staff are innovative, imaginative, and efficient. INTEC-CHILE's administrative procedures are excellent, based on a computerized accounting system which assures constant cost controls. Staff morale is high. The professional staff

is motivated to sell services and is aggressive in the marketing effort. The staff demonstrates competence and experience in preparation and selling of proposals, particularly in the face of competition.

As an example, during the 100-month period January 1974 through April 1982, INTEC-CHILE presented 3041 proposals to potential clients in the amount of US$42 million. Of these, 2323 proposals became contracts (76 per cent of the proposals submitted) in the amount of US$17.5 million (42 per cent of the face value of the proposals submitted).

2. Marketing strategies

The INTEC-CHILE marketing system is unique amongst technological institutes in developing countries. The system is capable of defining clearly the demand for INTEC-CHILE's services, establishing appropriate priorities for marketing efforts, and creating client confidence. The marketing effort involves frequent and continuous inputs from senior professional staff. The system is based on preparation of proposals by the senior staff, followed by personal presentations and repeated follow-up, as necessary, to obtain a decision on the proposal. The marketing effort is co-ordinated by two industrial engineers, who have an excellent knowledge of the market-place.

3. Staff, facilities, and equipment

The staff, although small, has a good mix of disciplines and industrial experience. The number of staff is at a minimum number necessary to provide stability and flexibility of operations, particularly for multi-disciplinary projects. This limitation, up to now, has been overcome largely through the ability of INTEC-CHILE to assemble project teams from several disciplines for effective services and problem-solving, using the matrix approach.

INTEC-CHILE also makes effective use of professionals from other technological institutions and universities, on a short-term basis, in order to obtain expertise for projects that INTEC-CHILE could not otherwise undertake.

INTEC-CHILE's premises are excellent. Equipment is adequate but not excessive. Some of the equipment is becoming obsolete. Much of the pilot plant equipment is constructed in INTEC-CHILE's shops. Of particular interest is the design of this equipment, which enables INTEC-CHILE to transport and set up pilot plant operations at the client's production or processing site (e.g. minerals processing).

INTEC-CHILE lacks some modern equipment necessary for provision of technical services (e.g. x-ray spectrophotometer for minerals analysis). The institute staff, however, are innovative in making sub-contracts or co-operative agreements with other technological institutes and universities (and even competitors) to use such equipment or to obtain necessary data.

The philosophy of obtaining external short-term expertise and arranging for use of equipment and/or services which INTEC-CHILE does not have, enables the institute to expand considerably its capability to prepare proposals and to perform services for clients. The advantages are obvious in that INTEC-CHILE is not confronted with maintaining such expertise for the long-term, and is able to use equipment on terms that it can afford.

4. Client relationships

INTEC-CHILE maintains frequent and continuous contact with its clients It is clear that the institute-client relationship is good, as evidenced by interviews with clients. Clients appear to be pleased with the quality of results and timely performance at reasonable cost which INTEC-CHILE provides. Even though similar services are available from other sources, such as the universities and technological institutes such as Fundación Chile or Centro de Investigación Minera y Metalurgica (who have been operating under more favourable conditions), both government entities and the productive sector continue to use INTEC-CHILE on a repetitive basis. Some former clients who have obtained services elsewhere, have returned to the use of INTEC-CHILE. The key seems to be quality of results and timely performance at reasonable cost.

As an example, during the conduct of this analysis, a random selection of ten clients during the period 1979 through April 1982, indicated that these clients had signed a total of 48 contracts for services with INTEC-CHILE. Ten clients were identified who had not, as yet, repeated contracts with INTEC-CHILE, for a variety of reasons, not necessarily related to dissatisfaction with INTEC-CHILE's services.

5. Multi-client services

Based on the realization that many small private industries cannot individually pay for technological services, but may be able to do so on a collective basis, INTEC-CHILE has started to create sectoral multi-client centres. Centre members contribute to the maintenance of the centre for

common problem-solving. Knowledge of the centre's capabilities also encourages industries to come to INTEC-CHILE for specific technical problem-solving on an individual basis.

A packaging centre has been in operation since 1980. Members of the centre receive staff training, information and technical details on the development of new packaging materials, and packaging testing. Such information is distributed to all members.

INTEC-CHILE is interested in establishing a number of additional technological centres for various private industry sectors, and is currently seeking financial support.

6. INTEC-CHILE contributions to the economy

As a part of this analysis, a request was made for examples of R + D or technical services performed by INTEC-CHILE which have had a positive impact on the Chilean economy. The data provided, for ten examples, reflects only the dollar value to clients as compared to costs paid by the clients to INTEC-CHILE. There is no way to know the extent of the social impact, in terms of increased employment or improvement in the quality of life, although it seems obvious that some such benefits resulted.

There is also no way to know whether these client benefits would have resulted, at least in part, in the absence of technical assistance from INTEC-CHILE. The data is shown in the table which follows.

7. Comparison with similar Industrial Research Institutes

It is useful to compare INTEC-CHILE's staff size, distribution of income and expenditures with similar technological institutes in developing countries. The institutes which have been selected are:

- ICAITI, Instituto Centroamericano de Investigación y Tecnológia Industrial, Guatemala;
- IIT, Instituto de Investigaciones Tecnológicas, Colombia;
- Shri Ram Institute for Industrial Research, India;
- SISIR, Singapore Institute of Standards and Industrial Research, Singapore.

These institutes are characterized by the necessity to recover between 70 and 80 per cent of their annual expenditures from contracted services to government entities, public and private productive sectors, and from bilateral

agreements and international organization assistance. The ability of these institutes to replace obsolete equipment, retain personnel between projects, and to re-train personnel in state-of-the-art technology, is assured through the mechanism of annual contributions in one form or another from their government sponsors.

Impact of Selected Projects on the Economy

Nature of Project	Paid by Clients US $	Benefit to Clients US $
Spontaneous combustion of copper concentrates	22,000	14,000,000 (5 years)
Spontaneous combustion of coal	50,000	1,000,000 to 5,000,000
Recovery of silver	10,000	5,000,000
Purification of quartziferous sands	12,000	100,000 annual
Determination of evacuation capacity of gases in smelters	30,000	6,000,000 to 8,000,000
Measurement of contaminants in smoke stacks	1,500	12,000
Optimization of functioning of pressure furnaces	10,000	40,000 annual
Change in fuels	10,000	140,000 annual
Cooking extrusion of texturized protein	50,000	12,000,000 annual
Technological development of milk substitute	200,000	60,000 (1974) to 2,800,000 (1979)

COMPARISON OF INTEC-CHILE WITH SIMILAR IRSIS

	INTEC		ICAITI		IIT	SHRI RAM	SISIR	
Year Established	1968		1956		1958	1950	1963	
	1979	1981	1979	1981	1977	1981	1979	1981
Staff Total	146	108	144	156	132	240	278	283
Professional	66	44	64	63	47	122	57	55
Non-Professional	31	22	15	21	40	20	146	149
Adm. & Services	49	42	75	80	45	98	75	79
Income (US $ x 1000)								
Contributions	-	-	328.3	204.3			994	1.681
Bilateral tech. cooperation	19	-	-	-			-	-
Regional or intl. orgs.	24	29	650.9	1.081.8			35	158
Contracts with industry	1.389	1.156	263.2	192.7	582.8		2.367	3.168
Contracts with government	3.014	2.281	185.8	399.8				
Gifts & donations	-	-	-	-				
Patents, licenses	218	-	-	-			-	-
Investments	-	-	-	-			-	-
Other	159	246	25.6	6.01			364	886
TOTALS	* 4.823	3.712	1.453.8	1.884.61 **			3.710	5.911
Expenditures (US $ x 1000)								
Admin. & management	1.209	1.262	521.8	768.3			2.431	3.056
In-hose reearch	74	85	70.5	58.03		***	69	177
Contracted research	2.238	1.288	737.3	1.244.6		***	35	158
Analysis, tests, QC	148	322	133.8	116.9		***	770	1.019
Investments	86	47	-	-			-	-
Equipment & facilities	33	22	7.8	95.3			553	608
Other	-	-	81.4	112.4				
TOTALS	3.788.	3.026	1.552.6	2.395.53**	800.5	1.250	3.858	5.018

** Deficits covered by Loans from Central American Economic Integration Bank, guaranteed by Gob. contribution in arrears

* Datas are related to sales which occured not exactly on the same time with incomes.

*** Excludes labor cost which is included in administration and management.

XII. Problems confronting INTEC-CHILE

INTEC-CHILE has been forced into a continual mode of reducing staff in order to balance costs with income. The present institute staff of 105 was scheduled to be reduced to 75 in mid-1982, but, due to high national unemployment, was deferred by Presidential decree until CORFO completes its assessment of INTEC-CHILE's future status. This loss of experienced personnel further erodes INTEC-CHILE's capability to provide effective services to clients and to market such services.

Support from CORFO has been declining consistently since 1979, to an estimated 12 per cent of total sales in 1982, from 60 per cent in 1979 and 48 per cent in 1981. While contracts from Government entities, other than CORFO, increased in 1981 and (apparently in 1982), contracts from the public productive sector have remained relatively constant at around 12 per cent of total contract income over the period. The private productive sector provided an average 22 per cent of INTEC-CHILE's contract income during 1979 - 1981; the estimated 59 per cent of contract income from the private sector for the first four months of 1982 either is an anomaly or represents increased effort by the institute to devote its major marketing effort to this sector. Nonetheless, it is clear that INTEC-CHILE is experiencing a severe reduction in income for the current year.

This decline in income appears to be directly influenced by several factors:

- the economic recession, combined with current Government free trade policies, which limit the ability of Chilean industries to produce products at a price which can compete with imported products;
- changes, by Government directive, which curtail the ability of CORFO to contract directly for technological services, and which also constrain expenditures for R + D by other government entities;
- competition from the universities and other Chilean technological institutes;
- lack of a source of income to INTEC-CHILE which would enable the institute to replace obsolete equipment, re-train professionals in state-of-the-art technology, and undertake initial R + D which would be of value to the country and the productive sector and which could lead to additional sales of services.

Industrialists interviewed, during the course of the analysis of INTEC-CHILE, were optimistic that, as the recession declines, they would have greater need for INTEC-CHILE's services. It should be recognized however that the private sector will continue to be unable or will have limited interest in assuming major financial responsibility or the risks involved in R + D. Private sector use of INTEC-CHILE can be expected to be limited to paying only for those services indispensable to their operations.

1. Changes in Government policies supporting R + D

In 1981, the Government modified its policies relating to R + D. The Government recognized that development of natural resources is the responsibility of the State, but maintained that technological development is the responsibility of the productive sector. The Government has further stated that it will support R + D where it can be demonstrated that the social benefit is greater than the productive sector benefit. If benefits are nearly equal, joint Government-productive sector funding is visualized. If benefits are greater for the productive sector, no Government funding will be provided; development costs will be the responsibility of the productive sector.

Formerly, CORFO was able to exercise considerable discretion in awarding contracts for R + D and services to INTEC-CHILE and other technological institutes. These contracts often provided initial investments in technological development expected to be further financed and used by the productive sector after initial feasibility was established. In accordance with directives established around 1974, several state organisms, including CORFO, must submit proposed projects for consideration by ODEPLAN (Oficina de Planificación Nacional).

ODEPLAN will quantify projects in terms of compliance with Government goals and costs, social benefits, and benefits to the productive sector. If social benefits are greater, and other criteria are met, ODEPLAN will recommend support of the project by the Government. If social and productive sector benefits are equal, ODEPLAN will recommend joint Government-productive sector support. If productive sector benefits are greater, ODEPLAN will not recommend support. In the latter case, it is up to the productive sector to determine whether or not to support the project. This leaves a serious gap in the development process; the productive sector will not finance such

projects, INTEC-CHILE cannot finance the projects, and individual enterprises will only be interested in projects that serve their own interests.

Unfortunately, it appears that the time interval between the original idea and the project initiation involves several governmental agencies and a considerable number of actions, reviews, and returns to Government entities or others for further elaboration or comments, so that the process seems to require between one and two years. Since nearly all funding is on a yearly basis, it is difficult for Ministries as well as technological institutes to programme their activities in a coherent and systematic manner. A research institute can seldom wait two years for decisions about research projects, particularly if such projects are urgently needed for some component of the development process; R + D must be dynamic and not constrained by bureaucratic delays.

2. Funding of R + D under Law No. 33

A new law (DFL No. 33, 15 September 1981) has created a National Fund for Science and Technology, to be managed by the National Council of S/T with the help of CONICYT. Funding for R + D projects will be related to demand for R + D as identified by the Government and the productive sectors, following the criteria indicated above. A council will determine, each year, the percentage of funds available from the national budget. Insofar as technology projects are concerned, these should have a cost-sharing component from the productive enterprises. Awards will be based on relevance as well as interest of the enterprise to pay part or all of the costs. The concept of cost-sharing, in the opinion of the consultants, should be beneficial and is very successful in other countries.

For the balance of 1982, a fund of US$1 million has been set aside from the national budget. From this fund, 54 per cent has been committed to science projects, 32 per cent to technology projects, with the remainder committed to mixed projects. It appears that 855 proposals have already been submitted, which is a clear indication of the perceived need for R + D support in Chile.

INTEC-CHILE, as an entity of CORFO, is not eligible to submit proposals for consideration. INTEC-CHILE's principal competitors (universities, Fundación Chile and Centro de Investigación Minera y Metalúrgica) are eligible. If an eligible organization submits a proposal, INTEC-CHILE could be included as a sub-contractor. If INTEC-CHILE were to be re-organized as a private law corporation, it then would be eligible to submit proposals.

3. Industry tax credits for R + D expenditures

The Chilean productive sector realizes that technological development is essential if industry is to be competitive in Chile's internal markets and in external markets. The sector feels the need for improvement in processes and adaptation of new technology in order to offset the decline in productivity over the past 14 years. At the same time, particularly in the private productive sector, it is recognized that insufficient private funds are available to pay for more than essential needs and services.

In 1981, ASIMET, Associación de Industrias Metalúrgicas y Metalmecánicas, proposed more favourable taxation conditions to the Chilean Government to stimulate industrial research. The proposal is under consideration by the Government at the present time. It is clear that such a proposal, if adopted, would benefit all industrial R + D in Chile.

4. Competition

INTEC-CHILE is very preoccupied with what they regard as "unfair" competition from the universities, Fundación Chile, and CIMM. This concern is understandable in view of INTEC-CHILE's precarious financia. situation and uncertainty as to the institute's future status.

Nevertheless, it appears that INTEC-CHILE has demonstrated its capability and expertise, on many occasions, to win contracts against its competitors in competitive bidding situations. It also is clear that INTEC-CHILE clients continue to come back to the institute for additional services, even though these possibly have received proposals from competitors for similar work at a lower cost. Some former clients who used the services of the institute's competitors have returned as INTEC-CHILE clients. The obvious rationale is that INTEC-CHILE has demonstrated its ability to provide quality services on time and at a reasonable cost.

In the opinion of the consultants, the competition encountered by INTEC-CHILE is healthy. The stimulus engendered by such competition, particularly in view of the institute's current financial situation, has created in INTEC-CHILE an aggressiveness and dedication to effective marketing seldom found in other developing countries' industrial research institutes.

D. SUPPLEMENTARY SUGGESTIONS

XIII. Industrial research policy

In the executive summary, it has been briefly explained that most countries spend a substantial amount of money on industrial research. This is true both for capitalistic and socialistic countries. In capitalistic countries, it is easier to distinguish between industry-financing and government-financing. The idea of government-financed industrial research is relatively new. Few of the research institutes are more than 30 years old. Some mono-branch institutes are older. The benefit to the nations in terms of favourable industrial development varies considerably from country to country, and the issue of how to organize such research is subject to continuous discussion and evaluation. There are many pitfalls:

- If financing is too liberal, efficiency drops to a low level.
- What is intended to be industrial research often ends up to be purely academic.
- Attempts to be applied often results in inventing impractical and useless products or processes, and solving problems nobody is interested in except the scientists.
- Attempt to apply strict control and steering tends to kill initiative and creativity, and makes the institutes less dynamic and less able to exploit opportunities
- Attempts to involve industry tends to result in too much short-term work like trouble-shooting. The strategic research intended to meet the challenges of the future tends to be neglected.
- It has been experienced that it is extremely difficult to control the research by means of a central organization, even if it is assisted by various committees of academic and practical people. On the other hand, some national control and setting of research priorities is necessary. (In a country like Chile, the institutes have relatively more competence than both Government and industry, and have to play an important role.)

Despite all of these difficulties, industrial research is useful and more so as the country becomes more industrialized. Research does only to a limited extent create industry. It is first of all instrumental in improving it, supplying special know-how, and solving discrete problems.

Without Government contributions, it is more or less impossible to create a research system which will have much national impact. The industrial enterprises only want to pay for projects of immediate use to them. Long-

term strategic research becomes impossible. High-level sophisticated skills and facilities will not result, and the nation will become a second or third-rate nation highly dependent on others.

This statement is more valid for small than for large countries. The large countries, with their multi-national companies and well-endowed universities and foundations, may do well without government-financed industrial research. For the least developed countries, industrial research is of little use because there is no target industry. It must never be forgotten that it is not research that creates industry, but industry which creates a market for research.

The medium-sized countries like Canada, Netherlands and the Scandinavian countries have benefitted most, toegher with the new industrial nations in Asia (Hong Kong, Japan, Singapore, South Korea and Taiwan) from industrial research.

Chile is a country of a size, and with a potential, which could benefit very much from Government-financed research. As the industry grows, the market for research will expand. Assuming that this will happen, some money needs to be invested today (mainly research grants) to prepare for this future need. If this is neglected, other nations may win the race, and Chile may develop less favourably than its potential allows.

The benefits from establishing and maintaining a good research institute system can be summarized as follows:

1. <u>It can promote industrialization by</u>:

   - Producing highly skilled engineers and scientists who can undertake difficult tasks.
   - Making available sophisticated equipment for R + D.
   - Solving special problems for industry.
   - Developing new products and processes jointly with industry.
   - Improving quality control.
   - Mapping of natural resources.
   - Providing rationalization and automation, which can make the industry more competitive.
   - Up-grading imported technology and preventing it from becoming obsolete too early.
   - Making import and transfer of technology more efficient and avoiding poor investments.

2. It can have substantial social benefits such as:

- Creating more employment.
- Increasing the standard of living.
- Creating interesting jobs, thus preventing emigration of gifted personnel, particularly high-level academics.
- Improving the quality of the environment by reducing pollution, better community planning, etc.

3. Documentation

In the field report of Mr Rich H. Westergaard, some documentation on research policy in other countries can be found. The information was extracted from the UNDP/UNIDO IRSI evaluation study and from a Norwegian White Paper, part of which is in English. Both documents are available at INTEC-CHILE, as well as the two field reports prepared by the consultants.

XIV. Modes of co-operation between INTEC-CHILE and the University of Chile

Serious consideration is being given to merge some of the institutions of the University of Chile with INTEC-CHILE into one organization. A plan for this has been worked out already in considerable detail. The status seems to be that this plan will not be implemented, at least not in its present form.

A total merger has some risks and negative effects:

- It may give less incentive to stay competitive if each unit has less freedom and responsibility for its own finances.
- Elimination of competition is against the economic philosophy in Chile.
- University dominance could make the activity too academic.
- A merger of this nature may create a good deal of friction and discontent.
- To put all the "eggs in one hat" may be too risky.

There are other possible modes of co-operation which requires less drastic changes and may serve the same purpose:

- Stronger co-operation and co-ordination on a more informal basis is possible, but may not be enough. It may not materialize even if it is agreed upon.
- The consultants will suggest a third alternative which has been termed Co-operation Unit, and which is discussed separately as under 2.

Without further analysis, it is not possible to recommend one of the solutions.

1. Merger of INTEC-CHILE and the applied research activities of the University of Chile into a separate corporation

Serious consideration is being given to creation of a new corporation consisting of INTEC-CHILE and certain applied research centres of the University of Chile: Institute de Investigación y Ensayes de Materiales (IDIEM); Centro de Investigaciones y Aplicaciones Tecnológicas (CINAT); Centro Nacional de Electrónica y Telecomunicación (CENET); and possibly other centres.

This merger could result in a corporation comprising the services of 140 personnel from the above centres and income of US$4.2 million, plus INTEC-CHILE's staff of 106 and income of US$3.6 million (based on 1981 figures). Many of the current activities and capabilities of the University centres and INTEC-CHILE are similar, but the total capacity of the corporation would be more diverse; the corporation would have a greater capacity to provide co-ordinated services to the productive sector.

In principle, creation of this new corporation would appear to be realistic. The University centres have better and more modern laboratory equipment and pilot plants than is available in INTEC-CHILE. The University research staff usually have teaching duties in addition to their research activities, so that the requirement for support of "dead time" or personnel between projects would be diminished. Indirect costs of the corporation would be reduced by a combination of presently duplicated administrative and other support services. Post-graduate students would be readily available as junior assistants and technicians at lower cost. INTEC-CHILE staff, in some cases, would have an opportunity to teach seminars or courses in their speciality. Certainly, there would be greater opportunities to become updated in state-of-the-art technology. The combination of these resources could be expected to have a demonstrable impact on economic development in Chile.

In addition to contributions of physical facilities and personnel to the corporation by CORFO and the University, the new corporation would receive, from each of the patrons, a contribution to put the new organization in place and to sustain initial operations. The patrons would also be obligated to guarantee financially those agreements which the merged institutes or centres would have to rearrange with clients at the time of creation of the new corporation.

The advantages to INTEC-CHILE are clear. The University is also interested in divesting itself of contract R + D, since this seems to interfere with the normal teaching and basic research functions of the University. If the proposed corporation does not materialize, the University is thinking of creating its own corporation.

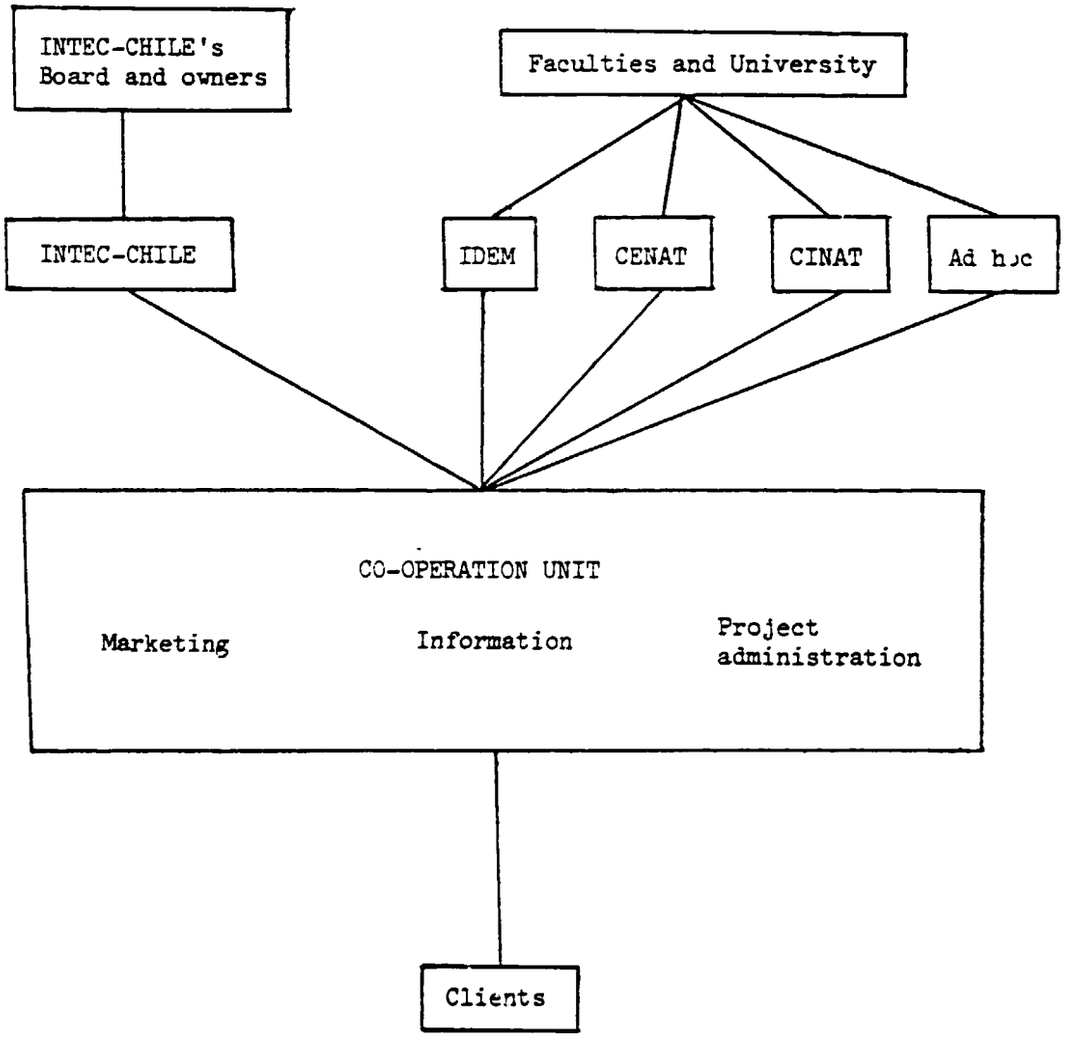
The principal problem confronting the proposed new corporation appears to be in the suggested management system. The Dean of the Faculty of Physical Sciences and Mathematics is proposed to be the President of the Board of Directors of six members, three each of which will be designated by CORFO and the University. The Board will determine the rules, regulations, and operational procedures for the corporation. In case of a tied vote on decisions, however, the tie will apparently always be broken by one of the Board members appointed by the University.

Inasmuch as the proposed corporation is intended to undertake R + D and provide services to government entities and the productive sector in order to stimulate economic growth, composition of a Board of Directors heavily weighted in favour of academia, can possibly result in decisions being made which favour University needs and academic programmes and which may be detrimental to the best interests of the corporation, and particularly to its ability to perform those services required by clients.

It would be much more realistic to create a Board from representatives of the Government and productive sectors, with a President selected from the productive sector. This would eliminate possible bias on the part of the Board and insure that the best interests of the productive sectors were being served.

2. INTEC-CHILE - UNIVERSITY OF CHILE CO-OPERATION UNIT

The chart below suggests the idea:



All participants retain their identity and autonomy. The co-operation is to be voluntary and strictly based upon mutual benefit. It ought to result in:

- Less overlap and competition, but should not eliminate it entirely.
- more joint effort projects with team members from both the University and INTEC-CHILE.
- Joint financing of new expensive equipment.
- More professional handling and administration of the University-executed projects.
- More easy access by INTEC-CHILE to the high-level competence of University professors.
- More easy access by the professors to the engineering and industrially experienced staff of INTEC-CHILE.
- Formats for establishing services will exist for most of the arrangements, thus facilitating co-operation.

Compared with a total merger, it seems to have certain advantages:

- It does not destroy any of the existing institutions, their names and reputations.
- If for some reason it is not a success, it is easy to go back to a set-up similar to the present.
- Money could be saved by rationalization and operation on a larger scale.

It may be a pre-condition that INTEC-CHILE becomes a corporation rather than a division of CORFO. This change ought to be fairly simply to achieve and no objections can be seen to doing this. CORFO can still own it alone or jointly with others.

Status of the Co-operation Unit

The co-operation unit can be organized in a variety of ways. It goes beyond the present study to work out the details, but below are suggested some modes of operation.

The Unit can have a more or less independent status. It could even be a corporation financed by INTEC-CHILE and the University by a certain percentage of project fees, and have its own board of management.

It could also be owned by the University and INTEC-CHILE, and be governed by a co-ordination committee. Most of its functions can be executed by INTEC-CHILE. The Unit need not be a physical entity. It will have a name of its own and its own letterhead telling that it represents both the University institutes and INTEC-CHILE.

Legal aspects and practical routines, etc, need to be worked out. A UNIDO project can be instrumental in doing this. A consultant, e.g. from SINTEF in Trondheim, Norway, who is familiar with this kind of operation, can assist in shaping and implementing the CO-OPERATION UNIT. A couple of visits of a few weeks duration each may be sufficient, as people in Chile can do most of the work under the guidance of the consultant.

3. INTEC-CHILE and Fundación Chile

The Fundación Chile today competes directly with INTEC-CHILE, and does so on rather unequal terms. Fundación Chile has strong financial resources, has better facilities and access to foreign expertise and information.

Fundación Chile has already blocked INTEC-CHILE from going into new and promising fields, and can do so again.

Many of the activities of Fundación Chile overlap with INTEC-CHILE's work. Some work-groups at INTEC-CHILE and Fundación Chile are undesirably small. Both do, for instance, have three professionals doing electronics. One group of six would be much better.

INTEC-CHILE argues that Fundación Chile has a low level of self-financing while INTEC-CHILE has a high degree of self-financing. A high degree of self-financing proves that an institute is efficient and is addressing problems of a practical nature. But an institute with low or even no self-financing may well be more beneficial to the nation.

The consultants have only paid brief visits to Fundación Chile and mainly had access to some printed materials.

It is the impression that Fundación Chile has been highly successful and beneficial. Its financial resources have proved fruitful and given it a freedom of action which pays off. On the other hand, it is felt that some of the R + D work could equally well have been carried out at INTEC-CHILE.

It should sincerely be considered to let INTEC-CHILE take over the laboratory functions and some of the activities which are of an R + D nature. This would strengthen INTEC-CHILE very much and need not be a loss for Fundación Chile, as it can concentrate on other activities of greater importance, mainly related to transfer of technology: such as:

- Provide special information otherwise not available;
- Expert services;
- Seminars and training;
- Feasibility studies requiring foreign expertise;
- Identification of business opportunities;
- Identification of R + D opportunities;
- Supervising R + D projects executed by INTEC-CHILE and others.

If Fundación Chile's role is changed in this direction, it ought to be able to strengthen the national research institutes instead of harming them. Fundación Chile will play a less controversial role. It will not need to go into routine work like analysing vegetables for pesticides, and it will be recognized that the yardstick of success for Fundación Chile is not the degree of self-financing but the fertilizing effect it has on the economy of Chile by promoting transfer of technology and by promoting industrial research on a more professional level by handing out and supervising R + D projects.

E. INTERVIEWS WITH REPRESENTATIVES OF GOVERNMENT AND INDUSTRY

CMDTE. EDGUARDO VILLALOBOS	-	Gerente de Disarollo, CORFO, INTEC-CHILE Presidente del Consejos
SLEMAN SABAJ ENRIQUE MANZUR	-	Jefe Guerra Electronica Armada de Chile
PEDRO VERGARA	-	Gerente General - CESMEC (Centro Control de Calidad)
	-	Ex-Gerente de Desarrollo CORFO
CARLOS CERUTI	-	Presidente Edwards y Ceruti.
	-	Presidente-ASIMET (Asociación de Industrias Metalúrgicas y Metalmecánicas.
	-	Ex-Rector Universidad Técnica Federico Santa María de Valparaíso.
	-	Consejero Directorio INTEC-CHILE
SERGIO OSSA	-	Asesor Ministro de Economía.
DANILO ROJIC	-	Asesor Vicepresidencia-CODELCO (Corporacion del Cobre de Chile.
CLAUDIO ANGUITA	-	Dean Facultad Ciencias Físicas y Matemáticas, Universidad de Chile.
JOAQUIN CORDUA	-	Director Programas Externos, Universidad de Chile.
WERNER SCHLEIN	-	Director CIMM, Centro de Investigación Minera y Metalúrgica.
LORENZO ZECCHETTO	-	General Manager ALUSA, Fábrica de Envases de Aluminio.
	-	Presidente Centro de Envases y Embalajes de INTEC-CHILE.

RAUL CONTRERAS	-	General Manager División Andina, CODELCO-CHILE.
	-	Vice-presidente Consejo INTEC-CHILE.
MANUEL PINOCHET	-	Presidente CONICYT.
	-	Presidente Fundación Chile.
	-	Presidente Area Tecnológica del Fondo Nacional de Desarrollo Científico y Tecnologico: DFL-33.
WAYNE SANDVIG	-	Director Fundación Chile.
MIRENXU VIDELA	-	ODEPLAN, Oficina de Planificación Nacional.
SERGIO BONILLA	-	Director INIA, Insticuto de Investigaciones Agropecuarias.

INTERVIEWS WITH INTEC-CHILE SENIOR STAFF

BARTOLOME DESEREGA	-	Director Ejecutivo.
M. ANGELICA MORENO MARIANO DONOSO	-	Marketing.
MANUEL TUBINO	-	Jefe, Area Proyectos e Industrias Varias.
FRANCO ROSSI	-	Jefe, Area Alimentos y Agroindustria.
CARLOS MOLINA	-	Jefe, Area Química y Metalúrgia.

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English
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ASSISTANCE TO THE
INSTITUTO DE INVESTIGACIONES TECNOLÓGICAS
(INTEC-CHILE)
SI/CHI/82/801

Addendum to Terminal Report maximizing INTEC-CHILE's techno-economic contributions to the country *

Prepared for the Government of Chile
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Richard H. Westergaard and James P. Blackledge, industrial research and organization experts

United Nations Industrial Development Organization
Vienna

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CONTENTS

ANNEXES

A. FOREWORD

The two consultants individually visited INTEC-CHILE in August and October 1982 respectively, and prepared individual technical reports * in English. They met in Vienna from 15 - 19 November 1982, together with the UNIDO staff member responsible for technical assistance programmes supporting Industrial Research and Service Institutes (IRSI's), and produced the draft report of 19 November 1982 in English, and which was subsequently translated into Spanish by UNIDO.

One purpose of the second mission to Chile was to make necessary adjustments to the draft report, in both languages. This was done in close co-operation with INTEC-CHILE. At the debriefing in Vienna, the final version of this draft report was prepared. **

The other purpose of the mission was to communicate with Chilean authorities (mainly CORFO and INTEC-CHILE's board of management) and discuss the various issues with them.

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* Documents DP/ID/SER.A/410 and DP/ID/SER.A/411 refer.

** Document DP/ID/SER.B/369 refers.

B. CORFO'S REPORT ON INTEC-CHILE

During the first meeting with INTEC-CHILE's Council Committee held on 10 December 1982, the consultants were given a document on INTEC-CHILE prepared by CORFO. The title is "Análisis Institucionales del Instituto de Investigaciones Tecnológicas - INTEC - Proposición del Futuro Rol Institucional; Octubre 1982" consisting of 74 pages.

In the preparation of this report, CORFO had access to material prepared by INTEC-CHILE and the two UNIDO technical reports. The consultants * were asked to read and comment on the report. The comments, which were prepared in English and Spanish, are presented as follows.

Comments on the CORFO report (Análisis Institucionales del Instituto de Investigaciones Tecnológicas - INTEC)

(i) Proposición del Futuro Rol Institucional; Octubre 1982

The consultants find the description of INTEC-CHILE, its role in the past and the future, as well as the description of the government policy correct and adequate and have no comments.

(ii) INTEC-CHILE's new function and way of being financed

A new, or rather expanded function for INTEC-CHILE has been proposed. It relates to acquisition and dissemination of information. This is a good idea per se. We assume that INTEC-CHILE will start various in-house projects aimed at providing information related to specific problems, industries or groups of industries (multi-client centres). Then the information will be disseminated in writing, by direct communication and seminars to the target groups. This ought to result in new, client-financed projects for the purpose of implementing the information.

The consultants have proposed that the basic financing of INTEC-CHILE should have two components:

- Plataforma Economica
- Contratos de investigación financiados por el gobierno

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* Documents DP/ID/SER.A/410 and DP/ID/SER.A/411 refer.

The consultants recommend this classification of the sources of basic financing. In the CORFO proposal, both of them seem to have been included in the new information function of INTEC-CHILE. This may perhaps be the only possible way to get money for INTEC-CHILE under the present established laws and government policy.

But it is a dangerous solution:

- The information service may appear not to be cost effective, since much of the money is used to provide the Plataforma Economica for INTEC-CHILE.
- Unless the new function is extremely successful, INTEC-CHILE may soon be in trouble, having none or an insufficient Plataforma Economica.
- The government-financed research projects are not mentioned as a source of income for INTEC-CHILE, (we distinguish between government grants for long-term development objectives and short-term projects where a government agency is the client). (See page 5 of the terminal report.) *

(iii) Things not dealt with in the CORFO report

- The report does not propose a solution to the problems arising from Foundation Chile's invasion of INTEC-CHILE's fields of work.
- The large new activity of INTEC-CHILE needs a steering committee. Also the individual projects will, if they are large, need an advisory group with people from the productive sector or from e.g. the University or other research institutes.
- The report does not propose a change in INTEC-CHILE's juridical status, which now prevents INTEC-CHILE from getting research grants through CONICYT.
- The report does not address the problem of better co-ordination with the universities.

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* Document DP/ID/SER.B/369 refers.

C. VARIOUS MEETINGS

There was a meeting with INTEC-CHILE's Council Committee and Development Manager Advisory group on 15 December 1982 (present were: Edgardo Villalobos, James Blackledge, Rich H. Westergaard, Bartolomé Dezerega, Rolando Soto, Carlos Ceruti, Tomás Vial, José Gomez and María Angélica Moreno).

CORFO accepted the views of the consultants as valid, but has to move carefully in the implementation of changes affecting other institutions, government policy and legal problems.

It was agreed that there is no disagreement between the CORFO and the UNIDO report and that the two can be considered complementary.

The only issue discussed was CORFO's idea of providing INTEC-CHILE with the necessary economic platform by giving INTEC-CHILE the new information function.

CORFO believes this is a good solution, but it has still to be accepted by ODEPLAN and the government, and it may be necessary to define in more detail how the money will be used and perhaps to split it up into money to be used specifically for the information project and money to be used for basic financing of INTEC-CHILE. This money only in part and indirectly relates to the information project.

The last meeting with INTEC-CHILE was held on Friday, 17 December 1982. The following persons were present: Messrs Edgardo Villalobos, Raúl Contreras, Carlos Ceruti, Luis Pardo, Carlos Bórquez, Rolando Soto, Tomás Vial, Eduardo Fernández Espinar, Tomás Reich, James Blackledge, Rich H. Westergaard, Bartolomé Dezerega, Sergio Escudero and Madams Isabel Letelier, Vivian Smith and María Angélica Moreno.

The meeting gave the persons present an opportunity to discuss in more detail the content of the UNIDO report. No need for changes or further statements resulted from the meeting, which went off in a most friendly atmosphere.

D. SUMMARY AND CONCLUSIONS

There is in the government and its various relevant bodies (ODEPLAN, CORFO, etc), a good understanding of the need to support industrial research and recognition of INTEC-CHILE and a will to maintain it in the future, and help it through the present crisis. A solution for 1983 will be found. In discussions with CORFO, it was expressed that although the CORFO report does not address all the problems dealt with in the UNIDO report, they fully recognized that it is urgent also to take up these problems and try to find solutions.

The UNIDO technical reports ought to be of considerable help in this process. This has been expressed by the leading persons, whom the consultants had the opportunity to talk with.

In the report of the two UNIDO consultants, these and other problems are addressed and solutions are suggested.

The consultants appreciate that it is most urgent to find a solution for financing INTEC-CHILE in 1983. This is an acute problem and CORFO seems to have found a solution which can work. The consultants do recommend the solution, but will suggest that it be considered a temporary solution, and that the year 1983 be used to find a more permanent solution and to solve the various problems identified in the UNIDO report.

Annex I

CO-OPERATION BETWEEN UNIVERSITY AND RESEARCH INSTITUTES
AND AMONG RESEARCH INSTITUTES (NORWEGIAN EXPERIENCE)

In Trondheim, Norway, the technical University has created an independent industrial research institute called SINTEF. The arrangement has been highly successful. SINTEF is the most successful IRSI in Norway.

Recently a 4-man committee and a management consulting firm have analized SINTEF's situation. A-41 p, report describes problems and achievements, the past and the future.

If Chile considers similar cooperation models they can have the mentioned report translated into spanish. A xerox of the Norwegian report is left with INTEC along with a lecture presented by the director of SINTEF, Johannes Moe.

To stimulate interest, some of the means of cooperation developed are briefly summarized below.

- A-type cooperation is of a more permanent nature and is based on a relatively high degree of integration. But the arrangements vary from one university institute to another over a wide range.

- The B-type of cooperation is mainly one of bookkeeping and some other administrative services given by SINTEF for a modest commission.

- Clearing. People from SINTEF serve the university as lecturers, supervision of post-graduate student and similar. The University gives to SINTEF the same numbers of manhours for SINTEF's project work.

- Sharing of personnel and equipment

- Post graduate work done which helps SINTEF in its work

- SINTEF personnel take a doctors degree

- Creation of special umbrella (cooperation) units, eg., related to the offshore industry

- All the cooperating institutes have their own identity and use their own name.

- SINTEF as such has about 900 full-time employees.

CONCLUSION: The arrangement has been highly benefical to the University (which has the majority of the board members)

The arrangement has strenghtened the Norwegian industrial research capability significantly.

Annex II

OIL POLLUTION CAUSED BY SHIPPING AND OFFSHORE OIL ACTIVITY

Assuming that INTEC is given the new role related to information, a nice project could be to address the problem of oil pollution such as:

- Amount of pollution in Chilean waters
- Probability of blow out and large ship wreckage
- Computer methods to predict oil spill drift, to be used both for strategical planning of the preparedness and for tactical decision making
- Mapping of coastal areas which are vulnerable to oil pollution
- Methods for calculating likely damage caused by oil spills, both direct economic damage and ecological damage
- Define situations in which dispersants are justified to beat oil spills and when they may not be used
- Dimensioning the local and national oil spill preparedness
- Organization of the preparedness
- What to do in case of underwater oil blow out?
- Testing and approval of oil-booms, skimmers and similar
- Identification of spilled oil by chemical analysis for the purpose of finding its source and punish the polluter

The world literature on oil pollution is very extensive: good sources of information are the proceedings from the many conferences.

Countries like USA, Canada, United Kingdom and Norway have done a lot of research (most of the Norwegian reports are in English language).

In connection with compiling and digesting oil pollution information it will be useful to visit the countries which have contributed to this research and establish a relationship, which secures receiving the latest news. A fellowship study abroad may be needed to be capable of doing a good job.

Much money has been spent already on oil pollution research in other countries and Chile need not repeat this work. But in order to benefit from the information it may be necessary to establish some new bodies (agencies) in Chile. Research will also be needed to adapt the foreign results to local conditions.

Annex III

AIM AND FUNCTIONS OF INTEC

1. AIM

The purpose of INTEC will be to provide a permanent infrastructure of physical and human resources to store, disseminate and transmit technological information making possible the transfer of technology developed abroad to our country and local achievement of technological advances.

2. FUNCTIONS

In order to achieve this goal, INTEC will have to operate on the basis of two functions, one of which is subsidiary, and the other not.

A. BASIC AND CONTINUING FUNCTION

INTEC's basic and continuing function is to provide technological information and documentation to:

public and private enterprises and bodies and

national industry

in order to enable our country to absorb technological advances.

In order to carry out this subsidiary function INTEC will have to establish itself as a technological centre for updating technological information and providing ready access to the information obtained.

In order to do so it will have to have a research staff to carry out the following duties on a regular basis:

Compilation of technological information from international sources;

Acquisition of data, carrying out of analysis and laboratory experiments and evaluation of the information obtained;

Classification and systematization of the information;

Dissemination and transfer of the information.

It will be necessary for the research staff to undergo further training from time to time, in keeping with the needs of the technological centre.

B. POSSIBLE SECONDARY FUNCTIONS

The possible secondary, non-subsidiary functions will have to be self-financing and will be carried out to the extent that they are required by enterprises and public and/or private concerns.

These duties will be as follows:

B.1. Provision of technological services

Research and development in the area of industrial technology oriented towards the introduction of new materials, products, equipment, processes and methods or the improvement of those already existing, and also towards promotion of technical innovation in the country's production and service sectors;

Adaptation of technologies to the conditions required by the users by carrying out the necessary studies;

Application of technologies in order to solve problems relating to industrial operation, improvement of industrial processes, start-up, environmental protection, etc.

B.2. Provision of specialized laboratory services such as:

Descriptive analyses of chemical, metallurgical, agricultural, forestry and other inputs and/or products; microbiological and other types of analyses.

Annex IV

SELECTION OF MULTI-CLIENT PROJECTS
INTEC-CHILE

1. Clients: Catering firms. Technical consultancy and quality control in food-processing. Food-handling, microbiological and nutritional inspection, quality control, personnel training.

2. Clients: Firms producing animal feeds, poultry-rearing concerns manufacturing their own foodstuffs and fishery companies producing fish meal.

   Control of mycotoxins in animal feeds.

3. Clients: Exporters of non-traditional fruits.

   Plant-protection treatment using methyl bromide fumigation for new fruit varieties for export (citrus fruits, peaches, cereals, nectarines, damsons, cherries and raspberries).

   While know-how is available in the case of apples and grapes, there is no experience, even in the United States, with the other fruits, and use of the methods known for grapes and apples does not give good results for other fruits.

4. Clients: Pulp and paper enterprises, firms and other types of plant located in areas where forestry and timber-producing activities are carried on.

   What would be involved would be the study, design and construction of demonstration models, with small-scale trials, of equipment for burning wood and forestry waste-products. These systems will vary according to the scale of the plant for which they are intended and the nature of the pre-burning preparation systems in use.

5. Clients: Small-scale concerns without mining know-how.

   The aim is to provide information, by means of a manual and practical training, on simple-technology systems such as the amalgamation, sample analysis and amalgam refining, etc. of gold, thereby transferring labour-intensive technologies used by the small-scale mining operators of the country.

6. Clients: Small-scale copper, gold and silver mining operators.

Description of the technologies of heap leaching, model economic evaluations for decision-making, consultancy services at the implementation stage. Low-investment technologies with low operating costs are envisaged.

Annex V

CARLOS CERUTI'S COMMENTS: PRIVATE SECTOR'S REPRESENTATIVE IN THE COUNCIL OF INTEC

Some comments concerning the reports on INTEC

(a) By the Development Department of CORFO;
(b) By Mr. R. H. Westergaard and Mr. J. P. Blackledge, the UNIDO experts

The two reports seem to me to be complementary.

They agree in their assessment of INTEC's current value in terms of the work it has carried out, the technical reputation it has achieved, the calibre of its personnel and administration, the experience gained in its marketing strategies and its substantial contribution to the national economy.

Furthermore, both assessments clearly indicate that the Institute has great potential for contributing to the future industrial development of the country, and that this potential should be exploited.

The main problem at present is the uncertainty of the Institute's financial status and prospects for the future; these are issues which must soon be resolved more or less definitively in order to ensure INTEC's stability as an institution and to enable it to operate effectively.

I think that a solution to the financial problem must be sought in terms of the approach most suited strategically to the needs of the present, in accordance with the circumstances and the policies determined by the Government. This means achieving an "economic platform", in other words the minimum required to provide an institution which can contribute to the country's development, as referred to in the report by the UNIDO experts, or using an "information function", as proposed by the Development Department.

I do agree with the UNIDO experts in considering that there is a risk in assigning such a broad range of duties for the "information function". I think that in this case a few clear guidelines should be laid down to enable INTEC to provide an efficient service, particularly at the beginning.

I agree that these few guidelines regarding the provision of technological information, as the basic function of INTEC, should be properly co-ordinated with the industrial development policies which the country may adopt for its future economic development.

It seems to me appropriate to transform INTEC into a corporation under private law, subordinate to CORFO and managed by a Board of Directors consisting of persons with proven experience in industry and applied research in the private and public sectors and the representatives appointed by CORFO to maintain close co-ordination.

I believe it is essential to seek some kind of permanent agreement which would permit real co-ordination, in guidelines for action and in specific operations, between INTEC and the Fundación Chile in order to avoid unfair competition and to encompass a wider range of areas of tehcnological research. I consider that the Council of CORFO itself should be responsible for reaching this agreement. I am not in favour of seeking a merger or institutional integration of the two bodies.

Similarly, it also seems to me to be necessary to try to arrive at comparable agreements with the national universities; this might perhaps be achieved through joint action by the Council of CORFO and the Council of Rectors of the Chilean Universities.

Carlos Ceruti Gardeazabal
Santiago, 17 December 1982

Annex VI

SUMMARY OF MEETING NO. 115
OF THE COUNCIL OF THE TECHNOLOGICAL RESEARCH COMMITTEE,
INTEC-CHILE

On 17 December 1982, the Council of the Technological Research Committee of INTEC-CHILE held its 115th regular meeting at its headquarters in Santiago at Avenida Santa María No. 06500. Attending the meeting, which was chaired by Group Commander (Signal Corps) Edgardo Villalobos Chaparro, were Council members Raúl Contreras Fischer, Army General (retired); Carlos Ceruti Gardeazábal; Rolando Soto Sobell, Army Colonel; Carlos Bórquez Kesler; Isabel Letelier Parga; Vivian Smith Fontana; and Luís Pardo Torres.

Also present at the meeting were Bartolomé Dezerega Salgado, Executive Secretary of the Committee; Sergio Escudero Cáceres, who acted as reporting secretary; Alfredo Vergara, Assistant Director of Operations, CORFO; and Tomás Vial, adviser to the Development Department.

Analysis of the INTEC evaluation reports

As planned, the Chairman pointed out that the Council should devote the meeting to an analysis of the two evaluation reports that had been prepared on INTEC - one by UNIDO experts R. H. Westergaard and J. P. Blackledge, and the other by the Development Department's evaluation team.

For this purpose, the following persons were invited to take part in the meeting: Eduardo Fernández-Espinar, UNDP and UNIDO Resident Representative in Chile; Tomás Reich, UNDP Senior Programme Officer; the experts Richard H. Westergaard and James P. Blackledge; and María Angélica Moreno, INTEC Marketing Director.

The Chairman thanked the representatives of international agencies and the experts for attending the INTEC Council meeting and for making it possible in that way not only to analyse the experts' report but also to compare it with the conclusions contained in the report prepared by the Development Department on the same subject. Accordingly, he gave the floor to the members of the Department's evaluation unit so that they might comment on the two reports.

Mr. Alfredo Vergara began the discussion by noting that, in his opinion, the two reports complemented each other extremely well and no major areas of disagreement could be found between them. On the other hand, they adopted different approaches to the same problem. Specifically, while the Development Department had analysed INTEC's role as an institution within the context of existing policies, the international experts had gone further to express their views regarding certain changes in the area of technology policy for the purpose of bringing out even more distinctly the role that should be played by agencies of that kind in national development efforts. CORFO, for its part, had taken those policies as a frame of reference and action for the purposes of its evaluation.

The experts' report, Mr. Vergara went on to say, contained important insights that were not considered in the CORFO report and which were related to the juridical restructuring of INTEC with the aim of making it a corporation under private law. Through this restructuring the corporation would have access to the funds held by the Technology Development Fund for financing projects of that kind. It was possible that in the future the Fund might become an important source of finance for technology studies.

On the point of unfair competition in the technology services market, he said that the same view was reflected in the evaluation prepared by the Department, especially in the assessment of the Fundación Chile, CIMM and the universities. CORFO, however, in its evaluation study of INTEC, had limited itself to an analysis of the problems of that institution and had not inquired into the question of possible changes within the agencies that were competing unfairly. That approach did not imply that there was no need for changes in those agencies, but was merely the result of a decision to confine the analysis to the pre-established terms of reference of the evaluation.

Among the most important points on which the two reports agreed, Mr. Vergara referred in particular to what the experts had termed the establishment of an "economic platform". As used, the term was similar to what in the CORFO report had been called the "definition of a basic function" for INTEC, one which would be financed by the Corporation itself.

The Chairman summed up Mr. Vergara's comments as indicating, primarily, that the frame of reference for the CORFO evaluation had not been so extensive as in the case of the experts' report. In any event, the Corporation was authorized to submit both frames of reference for the consideration of

the authorities in order to enable them to approach the problem with a greater wealth of background information and from differing points of view, since both approaches were applicable in the present circumstances.

One of the measures that had been referred to by the experts, he said, had to do with the change in INTEC's legal status. However, even though they were compatible with the guidelines laid down by CORFO's Development Department, measures of that kind had to be studied in greater depth for both their positive and their negative implications. It was in fact precisely because of its present structure that INTEC had been able to come up with rapid and streamlined procedures for the formulation and implementation of projects that otherwise would have had to surmount a series of administrative hurdles. Accordingly, the problem required greater study to ensure that any new legal status would not damage the current financial flexibility in CORFO-INTEC relations.

Mr. Tomás Vial said that there were several points in the experts' report that might be of particular importance and which he wished to discuss.

In the first place, the experts had warned against the danger involved for a multisectoral and multidisciplinary institution like INTEC, in terms of financing problems, should it become an engineering enterprise and thus forfeit its status as a research institute in the technology area. He regarded that cautionary note as very important and felt that it should be given the most careful attention in any kind of analysis.

In the second place, he thought it important that the report should provide statistics on the involvement of the private and public sectors in the technology research activities of other countries in order that an analysis comparing activities in Chile in that regard might be prepared.

Another important point in his view, and one which the CORFO report could not go into for lack of the data available to the experts, concerned INTEC's management skills and procedures, particularly with regard to administration, project monitoring, programming, and the like.

Mr. Vial went on to say that when the experts used the term "economic platform", they were referring to the ability to plan activities over the medium term, something that was essential for any technological research institute and which did not mean that there was no room for annual adjustment

programmes. That was another point he regarded as very important in that it implied the need to plan ahead not merely for a given budgetary year but on a medium-term basis as well.

In the same connection it was important to point out that the percentage value which the experts had recommended as INTEC's economic platform, namely, 50 per cent of the Institute's total activity, exactly matched the figure for the permanent "basic function" suggested by CORFO, so that the two reports agreed not only in conceptual but in quantitative terms as well.

Mr. Vial noted that at the end of their report the experts had put forward a realistic proposal regarding relations with the University. They had analysed not only the advantages that might flow from such a relationship but also certain of the negative factors, and had in that way provided a fairly objective overview of the problem that would prove very useful for the work that would have to be done in the future.

Concluding his remarks, Mr. Vial said that all the ideas contained both in the CORFO report and in that of the experts would have to be placed in a time-frame, and that accordingly it would be necessary to establish a time-table or programme of work for implementation of those ideas.

Addressing himself to the remarks of the previous speakers, Mr. Westergaard said that together with Mr. Blackledge he was preparing a report on their last visit to Chile and that the report would contain two documents from the director of the co-operation unit of a Norwegian university describing some of the mechanisms the university used in its relations with research institutes. Those ideas, he added, were entirely applicable to the Chilean situation and specifically to the problem of INTEC's relations with local universities.

On the matter of relations between the University and research institutes, Mr. Blackledge said that throughout his university experience he had observed the existence of a series of problems with the University's academic authorities, but that nevertheless it had been possible in a very real way to bring about co-operation on an individualized basis or through inter-departmental relationships. The Institute was providing marketing and administration services to the University, since those were the services that were best developed there. For that reason he thought that INTEC had the administrative and managerial capability to establish such a co-operative

relationship with a number of universities and not necessarily with only one; the need was to work with persons interested in carrying out research and development projects, and to disregard those officials who were interested in basic research only.

Regarding the economic platform, Mr. Blackledge expressed the opinion that specific research objectives and priority areas should be identified; that was something the experts could not do because of their unfamiliarity with national conditions. That could probably be achieved very effectively through multi-client projects, since such projects pursued particular objectives or targets.

The Chairman informed the members that Mr. Carlos Ceruti, who had had to leave the meeting because of unavoidable prior commitments, had left his comments in written form. Because of Mr. Ceruti's great prestige and experience, he, the Chairman, wished to bring them to the attention of the Council.

To begin with, Mr. Ceruti regarded both reports, the experts' as well as CORFO's, as complementary, and in that he agreed with the views that had already been expressed in the Council. The Chairman said that Mr. Ceruti had called particular attention in his written comments to the fact that both reports agreed with respect to the usefulness of INTEC's work and its great potential for contributing to the country's industrial development.

INTEC's main problem, in Mr. Ceruti's view, lay in the Institute's present precarious financial situation and in its future financial prospects. A final solution to that problem had to be found in the short term in order that INTEC might be placed on a solid footing as an institution. He had gone on to say in his comments that the solution to the financial problem should be sought through the approach best suited to the needs of the moment and in harmony with the policies already laid down by the national Government. To that end, valid approaches might be the "economic platform" solution proposed by the experts or the establishment of the "information function" recommended by the Development Department.

Mr. Ceruti, the Chairman continued, agreed with the experts regarding the inherent risks in taking on so wide an area of responsibility as the information function, and for that reason he believed that there was a need for the formulation of certain specific guidelines - in all cases consistent

with the guidelines for national industrial development - which would govern INTEC's work and enable it to provide efficient and effective service.

Mr. Ceruti was also in total agreement on the advisability of transforming INTEC into a corporation under private law, subordinate to CORFO and under the management of a board made up of persons of demonstrated experience in industry and in the area of research and development. That would lead to the forging of a permanent co-ordination link with the user sector.

Finally, the Chairman added, the thrust of Mr. Ceruti's comments was towards the search for appropriate co-ordination in the activities of both INTEC and the Fundación, with a view to avoiding unfair competition and to extending the technological research effort to a larger number of fields, not through the kind of fusion and integration schemes that had been proposed, but through the intervention of the CORFO Council. A similar effort should be undertaken with regard to the universities through co-ordination with the Council of Rectors.

Concluding his summary of Mr. Ceruti's comments, the Chairman said he himself agreed with the latter suggestion concerning the Fundación Chile, since such co-ordination was possible through CORFO's Executive Vice-President, who was a member of both the Corporation's Council and the Fundación Chile.

When asked for his views on the two reports submitted, the Executive Secretary agreed that they were complementary and approached the INTEC problem in the general way that could be expected, since they provided a basis only for the formulation of short-term courses of action, while the task of designing operational policies for the long term still remained to be taken up. In view of that fact he thought it necessary to begin work at once on the preparation of the necessary subsequent steps involved in the formulation of the long-term operational plans.

In Mr. Dezerega's view, given the limited time available to them, the experts had not been able to offer a more detailed analysis in their report, and he was favourably impressed by the way in which, in so short a period of time, they had managed to gain so accurate an understanding of national conditions, which in the area in question were quite complex even for Chilean nationals with years of experience in the same type of work.

An evaluation having been made, it was for INTEC to take the next step, which would consist in involving its professional staff in the process in order to give operational content to the general guidelines that had been suggested. He was convinced that the INTEC problem would not be solved once and for all until there was an analysis of the country's system of science and technology in its entirety. The absence of that kind of comprehensive focus in general policy thinking had been a serious shortcoming which had had adverse effects on the work of the Institute. It was clear that the problem lay outside CORFO's capabilities and scope of activity, and for that reason it was not the proper role of the Corporation to lay down policy guidelines in that area, but rather to apply them.

A genuine technology policy had, in his opinion, to be an integrated, comprehensive one, and could not arise merely from the juxtapositioning of individual sectoral policies. That, he thought, had been the weakness of the approach adopted by the National Planning Office.

Mr. Dezerega took the position that because of the very nature of technological research, with its intimate links both to science and to the multidisciplinary and multisectoral process of development, an effective technology policy required a horizontal overview of the problem in conjunction with the sectoral view. What had actually happened, he thought, was that greater emphasis had been placed on the sectoral aspects of the problem, while the horizontal approach - which was precisely the element linking technology to development - had been neglected. That was the area where CORFO's Development Department had a very active role to play as the unit which had at once a sectoral and an overall view of the problem.

Considering that the official documents contained no comprehensive technology policy, he thought it would be a good thing to recommend that the initial expert report should be brought to the attention of the Office of Planning as reflecting the opinion of the Council, in order that the Office might take a decision on the matter. If it should prove possible to have the Office formulate and approve such a comprehensive technology policy, then a subsidiary development plan could be prepared to define, over the medium and long terms, the specific research and development activities to be carried out by such institutions as INTEC, CIMM, Fundación Chile and the universities.

Since it was the State that provided the lion's share of the financing for such activities, it was the State's task not only to establish the policy but also to formulate the specific subsidiary plans on an annual basis and with sufficient lead time. Once the plans had been published, it would be a relatively simple matter to guide the information function and properly scale the "platform" to which the experts had referred.

Since INTEC-CHILE was essentially a development tool, the correct definition of its mission flowed, first, from a systematic consideration of its objectives in their broad and general sense (CORFO Development Department) and, secondly, from its institutional structure.

In conclusion, Mr. Dezerega suggested that both the experts' and CORFO's final reports and the experts' field report should be submitted to Corporation officials for their consideration with the recommendation that the effort to describe the bases of a comprehensive technology policy be started.

The Chairman thought it would be very useful to present to CORFO the views contained in both reports since, albeit within different terms of reference, those views pointed towards similar solutions. He also agreed that the INTEC problem had to be analysed as part of a comprehensive approach to the country's scientific and technical establishment, and that discussions would go forward in that area as well.

Mr. Eduardo Fernández-Espinar, who attended part of the meeting, pointed out that, like all technical co-operation projects handled through the international system, the project in question represented assistance to the Government of Chile; on the basis of what he had heard at the meeting, the experts' report fully met that objective, so that the actual implementation of the project was now in the hands of the country itself.

He expressed his satisfaction at the way the work performed by the organizations he represented, UNDP and UNIDO, through the efforts of Mr. Westergaard and Mr. Blackledge had been received. That work was in the spirit of genuine international co-operation, having been complementary to the work of the national experts. However, despite the fruits of the international technical assistance, fruits that were tangible in that very project undertaken on behalf of INTEC, the absence of a technology policy was, as had been pointed out, rendering the co-operation extraordinarily difficult.

Mr. Fernández-Espinar went on to say that his responsibilities as Resident Representative included, as an element of the greatest importance, the allocation of international technical assistance monies to local scientific and technical development. Nevertheless, and despite the priority importance attached to that area in Chile, in actual practice the agencies responsible for the provision of such assistance had encountered difficulties in their work because of the absence of a general policy setting forth those areas in which the local Government wished to channel the international co-operation.

He concluded his remarks by expressing the opinion that ongoing assistance to institutions such as INTEC, which had shown themselves to be valuable national development tools, not only in Chile but in other countries as well, would continue in the future to enjoy the full support of the organizations he represented.

Mr. Edgardo Villalobos said that it was now up to CORFO and INTEC to inform the competent national authorities of the results of the joint international and local co-operation effort sc that satisfactory solutions for the short, medium and long term might be quickly found.

The Chairman, speaking in his own name and on behalf of the Council, again thanked Mr. Westergaard and Mr. Blackledge for their work, which was of great value and would be put to the most effective use.

In turn, the experts thanked the Chairman for his kind words and expressed their pleasure at having had the opportunity to work in Chile and their gratitude for the facilities that had been made available to them during their assignment and for the understanding attitude towards their work that had been shown by the persons with whom they had come into contact.

With no further business before it, the meeting rose at 1.30 p.m.