The Science and Technology Policy Instruments Project

International Development Research Centre
The
Science and Technology
Policy Instruments (STPI)
Project

A comparative research effort among
less-developed countries to examine
ways and means of implementing
science and technology policies in
the industrial sector

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Postal Address: Box 8500, Ottawa, Canada K1G 3H9
Head Office: 60 Queen Street, Ottawa
Background to the STPI project

The idea of organizing a research project to identify and assess the different instruments available for implementing science and technology policies in underdeveloped countries originated in February 1971 at a meeting of representatives of Latin American science policy organizations held in Lima and Cuzco, Peru. At this meeting policymakers and planners in the science and technology field expressed their interest in obtaining more information and knowledge on these issues. The initial objective was to survey and compare the ways in which different underdeveloped countries approached the problem, in order to generate knowledge that would help planners and decision-makers to choose the best way of implementing science and technology policies in their own countries.

During 1971 contact was established with several international organizations, and both the Department of Scientific Affairs of the Organization of American States (OAS) and the International Development Research Centre (IDRC) of Canada showed interest in sponsoring a project in this area. Background reports were prepared and feasibility studies carried out in Peru and Argentina. The results of these studies, together with a draft proposal, were considered by participants from 10 countries at a project-identification meeting convened by the IDRC in Barbados in January 1973. The outcome of this meeting was a research proposal that was submitted by each participant to his own institution for approval and to the IDRC and the OAS for possible funding. Nine of the original 10 countries decided to join the project and subsequently two others applied for membership.

The budget for the project is divided into two parts: an international component covering the cost of meetings, international training, consultancy studies, and the field coordinator's office; and the national components for each country project team. The first is financed entirely by the IDRC, whereas the second is financed in part by the IDRC and the participating countries, with the OAS contributing funds to some of the Latin American teams. The IDRC and the OAS approved their contributions to the project in 1973, and research work began in most countries in late 1973 and early 1974. Approximately Can. $2 million will be allocated to the project over a period of three years. Around 50 per cent of these funds are provided by the IDRC, 35 per cent by the countries, and 15 per cent by the OAS. The international component of
the project, comprising meetings, consultancy studies, and the office of the field coordinator, amounts to 20 per cent of the total budget.

The fact that there is practically no body of structured knowledge about the implementation of science and technology policies was the main justification for organizing this project. Whereas the art (or science?) of formulating policies is relatively well advanced, little is known about the procedures, ways, and means to put these policies into practice. The background studies showed that no concerted efforts were being made to study this problem in developed or less-developed countries. However, since those studies were finished, at least four projects have been organized in developed countries. The first, by the OECD, intends to study the effect of government policies to stimulate technological innovation in OECD member countries. The second, by an MIT team, is oriented toward policies in the United States and a few selected developed countries. The third is organized at the Science Policy Research Unit at the University of Sussex and seeks to examine the effect of government intervention on technological innovation for four western European countries. The fourth is a proposal by a group of researchers from Northwestern University to study the factors affecting the utilization of technological innovation in less-developed countries. All of these may provide some useful information for comparative analyses with the results to be obtained in the STPI project.

It must be emphasized that the project is oriented toward examining the way in which policies can be implemented in less-developed countries. The gap between policymaking at the higher levels and decision-making at the productive unit and government agencies level appears to be very wide. This underscores the importance of a project aimed at furthering knowledge about the ways of bridging this gap, particularly through the exchange of experiences among less-developed countries.

The STPI project is a research effort that arose from a clearly identified need expressed by policymakers and planners of less-developed countries; it was organized and structured primarily by researchers from these countries — with the encouragement and support of two international organizations — and it is oriented toward and implemented by researchers and policymakers from the Third World countries for the benefit of their countries.
The approach to the STPI project

The research approach and the philosophy behind STPI can be summarized as follows:

a) The research is action-oriented in the sense that it aims at producing knowledge that would feed directly into policymaking, decision-making, and planning activities. It should also generate a learning process shared by all the participants that would lead to better implementation (and formulation) of technology policies. This implies leaving aside the more traditional concept of academic social science research and replacing it with an action-oriented research approach into the problem domain of science and technology policy implementation.

b) The research will not focus on the policy formation process at the macro level, or on the individual processes of technology decision-making at the micro level (productive unit, government agency, research institute, etc.), but rather on the interrelations between these two. The idea is to examine the instruments and mechanisms that mediate between the macro and the micro decisions. One of the main aspects to study will be the divorce — or coincidence — of individual rationality at the micro level and of collective rationality at the macro level, always in relation to science and technology policies, plans, and decisions.

c) The research will be both interdisciplinary and interinstitutional in each participating country. Mediating instruments and mechanisms will be studied by teams consisting of lawyers, economists, administrators, scientists, and engineers. They should jointly identify and characterize instruments, assessing their relative effects. The research will also require participation from government agencies, private enterprises, and research organizations. Not all of these will be directly involved in carrying out the research, but their collaboration to supply information and to feed their points of view into the project will be necessary.

d) The research will be contextual in the sense that it postulates that instruments and mechanisms to implement science and technology policies cannot be adequately studied without taking into account the specific context of underdevelopment in which they
operate. Moreover, it also postulates that the interactions among different government policies play an important role in shaping scientific and technological behaviour. This requires that, starting from the point of view of technology and science policies, the interrelations with the main economic, educational, and social policies be worked out to uncover the overall resultant policies for science and technology. The same applies to the instruments and mechanisms that are employed to implement these policies.

e) These considerations lead to a comparative research project with a common approach and a shared conceptual framework, but which at the same time is decentralized, flexible, and organized on a national basis. Each participating country would agree to exchange a minimum level of information on all phases of the project, but this does not imply that all countries must share all the information they acquire through their own research efforts or that any country could not study in greater depth some specific aspect of the project in which it is particularly interested. Ultimately the project should lead to the establishment of a network of interrelated researchers in the Third World, who would learn from each other and who would hopefully remain in contact long after the instruments project is over.

Furthermore, the first phase of the project, which deals with the role of the scientific and technological system in each participating country, gives an opportunity to describe and discuss the political orientations of the participants and of the project teams. In comparative social science research among the Third World countries there is nothing to be gained by shying away from these issues. One last issue that must be raised refers to the political and ideological content of the project. Clearly it is not possible to leave aside considerations of this type when organizing a comparative research project on the instruments and mechanisms used for implementing science and technology policies, for these are greatly affected by political and ideological considerations. The point to be made is that the autonomy of national teams and the agreement to exchange a minimum level of information on all phases of the project would permit a constructive dialogue among all participants, regardless of their political views.
Objectives

The general purpose of the project is to gather, analyze, evaluate, and generate information that would help policymakers, planners, and decision-makers in developing countries to specify the ways and means for orienting science and technology toward the achievement of development objectives. In particular, the project should help to:

- develop indigenous capabilities in science and technology appropriate to the countries' needs;
- better utilize these capabilities in the productive sector and other areas of socioeconomic activity;
- improve the process of importing technology in such a way as to maximize its beneficial effects and minimize its detrimental effects;
- absorb and adapt the imported technology linking it to the indigenous scientific and technical activities.

The realization of these general objectives will require the project to focus on:

a) Identifying the general role that science and technology play in attaining development goals in different socioeconomic and political systems. This involves an analysis of the functioning of the scientific and technological system and its relation to the national economy and development objectives in each of the participating countries;

b) Identifying major instruments and mechanisms that are most likely to be effective in implementing science and technology in a given context. This will involve an analysis of the use of both direct and indirect policy instruments on the technological behaviour of government agencies and productive units;

c) Identifying and analyzing key factors that affect the technological behaviour of enterprises in selected sectors of the economy. The purpose is to examine the effectiveness of policy mechanisms and instruments from the perspective of the manager or entrepreneur who makes technological decisions in the productive unit;

d) Examining the major controls, practices, and procedures followed by government agencies and departments that make policy decisions for science and technology. This implies examining the factors that affect the behaviour of government officials with regard to administrative controls that refer directly or indirectly to science and technology policies;
e) Exploring and identifying the policy instruments, including those in other areas of government policy, that are likely to have a significant effect in promoting the development of an indigenous scientific and technological capacity geared to the needs of development;

f) Carrying out comparative analyses of the effect that different instruments are likely to have in diverse environmental conditions.

As a result of these comparisons it should be possible for policymakers concerned with applying science and technology to the achievement of development objectives to identify the mechanisms and instruments that are most likely to have the desired effects. Other subsidiary objectives would be to develop and sustain an international network of Third World researchers in this field and also to advance the state of the art of science and technology policy research.
Organization of the project

In each of the participating countries there is a project team led by a country coordinator, who is responsible for the conduct of the project in his country. A coordinating committee, composed of all the country coordinators, meets at least twice a year to monitor and evaluate the progress achieved.

There is a field coordinator who is in charge of the international component of the project. He is responsible for organizing communication and information flows, for providing methodological assistance to the country teams, and for organizing and carrying out the synthesis and comparative research efforts. The field coordinator also acts as secretary to the coordinating committee.

The coordinating committee:
- approves the field coordinator, who is accountable to the committee for all technical matters;
- identifies the international consultancy studies to be commissioned for the project;
- sets the time, location, and agenda of its own meetings, and chooses its own chairman;
- establishes the procedures for synthesizing the country studies in the final phase of the project;
- specifies the terms on which additional funds will be accepted for the international component of the project.

The field coordinator:
- helps to develop methodological guidelines for the country studies and consultancy studies, and makes the reports available to the country teams;
- coordinates the work of the country teams and facilitates communication among them;
- carries out "trouble-shooting" activities at the request of the teams;
- organizes the meetings of the coordinating committee;
- organizes training courses, commissions consultancy studies, and carries out other duties that might be assigned by the coordinating committee within the limitations imposed by the budget for the international component of the project;
- is responsible for the comparative aspects of the project.

Each country project team operates autonomously, but is expected to exchange the information agreed by the coordinating committee.
Structure of the project

The project is divided into five phases. The fifth phase includes a comparative and synthesis effort that will integrate the results of the national studies and the consultants' reports. The phases are summarized as follows:

Phase 1 consists of a general diagnosis of the evaluation and present state of science and technology in the country. It will generate the essential background information needed to assess the relative effectiveness of different policy instruments in a variety of conditions of underdevelopment.

Phase 2 contains an examination of the role of government in the formulation and implementation of science and technology policies. To do this it will be necessary to consider both the explicit science and technology policies and the implications for science and technology in other government policies. It will also be necessary to study the relationship between policies and the influence on contextual factors. This phase would include an examination of the major mechanisms and instruments through which science and technology policies are implemented and would lead to an identification of those that warrant further detailed study.

Phase 3 consists of a series of empirical studies carried out to test the effectiveness of alternative mechanisms and instruments for implementing science and technology policies. The focal point of Phase 3 studies will be the productive unit and the studies will be concerned with the "demand" that these create for technology. The information acquired in this phase would make it possible to select the most appropriate instrument, or cluster of instruments, given specific goals and conditions. One of the first tasks to be carried out will be the choice of industrial branches for study and of the enterprises that will be analyzed.

Phase 3 would involve two types of studies:

a) Top-down studies that start with government policies and trace the mechanisms and instruments used to implement them to assess their effect on the technological behaviour of productive units.

b) Bottom-up studies that start with the individual productive units or entrepreneurs and trace the factors that affect their technologi-
cal behaviour. This should lead to an identification of the most effective measures that government might take to assist the productive units in their technological development.

During this phase concern is primarily with empirical studies on the "demand" for science and technology. It would also include studies of the linkage between the productive units that provide the demand for technology and the local indigenous capability for producing it.

Phase 4 consists of the empirical studies of the effect that the instruments for implementing science and technology policies have on the behaviour of organizations that produce and "supply" scientific and technological knowledge. In a sense it parallels Phase 3, which refers to the "demand" for technology and follows similar steps. These are:

- identification of the sectors and institutions that will be studied in detail;
- carrying out studies of those government policies that influence the behaviour of research organizations and departments engaged in the production of scientific and technological knowledge. These studies would assess the direct effect of the mechanisms and instruments used to implement policies;
- carrying out case studies that focus on a specific institution to identify the factors that affected its behaviour and its capacity to supply scientific and technological knowledge;
- examining the nature of the linkages between the organizations in the "supply side" and those in the "demand side" that were analyzed in Phase 3.

Phases 3 and 4 complete the empirical components of the project. They should lead to a validation or rejection of the postulates and hypotheses that were derived in Phase 2.

Phase 5, the last phase of the project, will consist of several comparative studies that will integrate the results of the research efforts at the national and international levels. These syntheses should make it possible for policymakers to study the impact and effect of alternative mechanisms and instruments for implementing science and technology policies in a variety of conditions of underdevelopment.
Conclusion

The STPI project represents a novel form of collaboration among Third World countries in the field of science and technology policy research. It is probably one of the largest projects ever organized on this subject, and also one of the few that seeks primarily to provide information and advice to policymakers and decision-makers in the participating countries.

One of the key characteristics of the STPI project is its high degree of autonomy with regard to the content and orientation of the research. It is carried out by a network of autonomous country project teams that work together by virtue of agreements reached at the level of the coordinating committee, implemented through the field coordinator's office and through the national teams themselves.

The last point to emphasize is that the STPI project was conceived and organized and is carried out and coordinated by researchers and policymakers from the Third World. It is a collaborative effort that uses an ad hoc organizational structure outside the established and conventional channels of international cooperation to serve the needs of less-developed countries in relating science and technology to development objectives. The organizations sponsoring the research in the STPI project have understood these issues and have given all their support and encouragement to it.