

DEMAND-PULL STRATEGY IN SCIENCE AND TECHNOLOGY AND DEVELOPMENT PLANNING*

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For my discussion, I will touch on the three guiding questions. These are:

1. How does NEDA (the Philippines' National Economic and Development Authority) consider science and technology (S&T) in development planning?
2. How feasible is the so-called demand-pull strategy in macro-planning?
3. How can we ensure participation of the "demand" sector in science and technology activities?

On NEDA's consideration of S&T in development planning, I will first consider the procedural and organizational aspects. When we were formulating the five-year development plan for the period 1978-1982, there was a question whether to subsume S&T portions in all the relevant chapters in view of the all-encompassing nature of science and technology, or whether to write a separate science and technology chapter. It was decided then to just have the S&T concerns permeate all the chapters or sectoral plans. But in the formulation of the 1983-1987 Five-Year Plan, a decision was made to include a separate chapter on science and technology. Thus, a planning subcommittee on science and technology was created.

The organizational machinery of development planning could be described as having three levels of decision making. At the helm is the cabinet committee on plan preparation. This is composed of the ministers, with the prime minister as chairman. The technical committee on plan preparation follows, with the deputy ministers as members. Then, there are the various subcommittees on plan preparation. Each subcommittee is composed of representatives (planning officers) from concerned agencies. The chairman is the representative of the lead agency represented. The subcommittees is tasked with the

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responsibility of drawing up the sectoral plans. Thus, the subcommittees created on S&T are parallel to all the subcommittees responsible for the sectoral plans.

In the substantive aspect of integrating S&T in development planning, it has been recognized that there must be an effective link between the various goals of the production sectors and the support sectors. Science and technology, together with development financing, infrastructure and development administration, must provide a facilitating and supportive role to the overall production efforts. Thus, there must be a certain degree of harmonization of goals and interests in the real sectors on the one hand, and the support sectors, on the other hand.

This makes the demand-pull approach in S&T a compatible approach with macro and sectoral planning. Just as the infrastructure program is being formulated to provide for the specific needs and requirements of the real production sectors, more efficient S&T efforts must cater to the identified priorities of the economy. This approach touches on the most basic principle in economics, that is, the allocation of scarce resources. Since we have limited resources, prudence and efficiency require that priorities be set, constraints be identified, and support strategy be formulated. Focus must be placed on areas which pose the bottlenecks in the sustained development of sectors where we have the comparative advantage, such as in some of the agricultural sectors, and in the more labour intensive industries. These bottlenecks might be in the use of technologies which are less efficient or not appropriate to the local or domestic socio-economic conditions and factor endowments.

Just as macro and sectoral planning have short, medium and long-term perspectives, supportive plans such as the S&T plan, must also address these time perspectives. We plan for economic development and economic development implies changes in the conditions and the structure of the economy. We have to distinguish between the two groups of industries or sectors and treat them separately: one for the immediate creation of employment and other growth benefits, and the other for the long-term development of the economy which needs to be fostered for the future.

In development planning, we must have an idea of what sectors would be considered as the priority areas. For example, with the present plan updating, we are focusing on balanced agro-industrial development. Emphasis will be placed on the more efficient exploitation of vast agricultural potentials in line with the thrusts of attaining self-sufficiency and promoting import substitution, export development and foreign exchange generation. Self-sufficiency in highly nutritious foods and increased production of import substitutes, export crops, and agro-energy crops will be sustained through appropriate technology, more market-oriented pricing schemes, efficient distribution systems, and a more integrated institutional mechanism for agricultural development.

What is crucial is the choice of product and the target clientele, whether for domestic or for export, and the targeted ultimate beneficiaries, the consumers and/or the producers. We

more or less have an idea already of what crops, or products to put emphasis on. For example, crops wherein we have comparative advantage over other countries in production, or industries which are relatively labour-intensive and which utilize our indigenous materials will be emphasized. Once a decision has been made in this respect, the range of technological choice becomes limited largely because the quality standard required of the product is more or less determined by the nature of the product and/or the target client's needs. Some tie-ups which must be the concern of the demand-pull strategy are the following: establishment of the relationship of technology with locally available or potentially available inputs; relationship of the technology with present and future market demand; and the definition of the nature and type of technology required in terms of capital resources. It is necessary to link the technology as far as possible with available raw materials and local skills. Often the supply of foreign technology is closely linked with substantial and continuing imports of components and parts or processed materials from technology licensors. To the extent that alternative technology is available, the use of such technology may be preferred, provided that comparable production efficiency can be ensured.

The relationship of technology with potential growth of local skills is also of significance. This is necessary both from the viewpoint of generating and maximizing local employment as well as for effective absorption and adaptation of imported knowhow as rapidly as possible. It may also be necessary to link the type of technology to be acquired with the stage of industrial growth and with the extent of employment that can be generated without affecting efficiency when employment generation is the major focus of industrial policy. The most advanced technology in a particular manufacturing sector may consist of various alternative techniques that can be adopted in terms of their impact on imports required for maintenance, effect on employment, and growth of local skills and talents.

To be able to decide what industries or sectors and what target markets should be addressed, there must be a clear idea about what industries should be looked into in the next five, ten and 20 years in the light of the expected demand patterns both at home and abroad.

At the same time, the government will have to know what kinds of technologies will be required or preferred to attain the industrial structure desired in the long run. It is important to develop an adequate capacity to appraise the quality of technologies to be brought in or adopted, which in turn depends largely on the ability to shop around. For the development of such local capacity, constant local R&D efforts are essential. If the country is well-informed about the technological alternatives, the authorities should also be able to negotiate with the investors to make their production methods more suitable to the local development goals.

Once the effort is underway, the government can increase its positive role by encouraging forward and backward linkages through appropriate policies. A good example is provided

by the government vocational training centres offering plating and other services for small enterprises which enable the enterprises to work as subcontractors for multinational automobile assemblers. The Philippine Coconut Authority (PCA) provided financial assistance for a local company which developed coconut fibres into seat pad materials with encouragement from these assemblers. This kind of coordination by the government and local institutes seems much more likely to achieve results than government regulations simply demanding that foreign technologies adapt to local conditions and needs.

Another form by which S&T was permeated all through the plan was the presupposition of S&T support in sectoral policy implementation. For example, effective demand for S&T or for more appropriate technology is created when the government shifts emphasis from the traditional export products to non-traditional exports like electronic equipment and components, and optical equipment. This policy also encourages domestic processing or value added which may necessitate development of technology that will make possible the capital-labour substitution.

In our current plan updating, a running thread of Filipino ideology is being incorporated in the macro framework and in all the chapters of the Plan. This includes ideology of development anchored on self-help, self-determination and self-sufficiency.

How do we ensure participation of the demand sector in S&T activities? Greater participation could be encouraged through an effective reward and incentive system. Criteria which relate to S&T development could perhaps be incorporated in the evaluation of investments for BOI incentives. In addition, greater selectivity with respect to private investment, and efforts to improve the negotiating and bargaining position of recipient enterprises through regulatory control, will increasingly channel private investment and technology to selected growth sectors. Both these aspects are critical. The unrestricted development of technology or inflow of foreign technology can have significant techno-economic influence on sectoral production patterns and on indigenous technological growth. Varying degrees of regulatory control should be exercised so that technology inflow takes place primarily in sectors where it is necessary or desirable, and that it continues only for such period as is necessary for effective absorption. Consequently, various institutional and other mechanisms are needed to ensure technology inflow or development:

1. Takes place in identified sectors of growth
2. Is appropriate to local factors, conditions and situations
3. Is consistent with and complementary to domestic technological support
4. Is acquired on acceptable terms and conditions

In national development planning, there is a greater assurance for the participation and cooperation of the other sectors and agencies of the government in the implementation of the plan if their involvement has been sought at the very beginning of the planning process. I should think this will apply also in S&T activities. Technological progress should be viewed on a comprehensive basis and within a framework of a technology plan, the formulation of which should include the following essential steps:

1. The identification of technological needs
2. The development of an adequate technological information system
3. The growth of a technological service capability and specialized manpower
4. Monitoring technological changes
5. National regulation of foreign technology and services

The Identification of Technological Needs: Technological needs have to be identified, both at the macro level in terms of sectoral priorities and the technological inputs for priority sectors, and at the micro level, as requirements of process or production knowhow, provision for technological services, and specialized manpower training. At the micro level, these needs comprise aspects such as improvement of productivity, quality control, and technical support including information linkages. An assessment of technological needs would not only highlight the gaps in technology in critical production sectors, but also indicate the pattern of appropriate technological development.

The Development of an Adequate Technological Information System: This will ensure a flow of fairly detailed data and materials regarding production and technical requirements projected over a period of time at the macro level for the economy as a whole, together with specific growth projections and technical requirements in important production sectors and enterprises. Once the nature and magnitude are defined, the information system should also be able to identify alternative technological sources, both indigenous and external, for specific projects and enterprises.

The Growth of Technological Service Capability and Specialized Manpower: Inadequate technological service capability constitutes a major constraint. Such services range from macro level industrial planning, to micro level project identification, down to start-up and operations. The identification of gaps in service capability has to be done on a country-wide basis for priority sectors in the economy. A significant and related issue is the growth of specialized manpower skills. Although some efforts are already being made to assess the manpower requirements and a number of training programs are being implemented, manpower needs must be identified in greater detail, particularly at managerial levels and in engineering and design capability.

Monitoring Technological Changes: It is important that technological changes, particularly the foreign technology inflow, should be regularly monitored so that there is a constant feedback regarding the impact of foreign or domestic technologies in specific sectors and changes in technological needs and indigenous capability can be assessed and reviewed from time to time. The absorption of foreign techniques and processes and their suitability in a particular environment also need to be periodically assessed. Such monitoring would enable the identification of sectors where adequate domestic technological capability has been developed through indigenous R&D or absorption of foreign technology, and which could also be utilized by other sectors without taking recourse to further import of technology in the same field.

National Regulation of Foreign Technology and Services: Regulations must be viewed in the context of overall industrial strategy relating to the country's industrial and technological development. It would be necessary to consider the role of the regulatory agencies against the broader canvas of technological development and to discuss the policy and institutional relationships between such regulation and the fulfillment of the broader objective of growth and development of indigenous technological capability.