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Research Note

Criteria for Technological Choice Decisions

ASCI has been entrusted with a research study on the Criteria for Technological Choice Decisions by the Commonwealth Secretariat, London. With the help of country studies on the governmental mechanisms of technology Choice, it has been proposed to derive policy imperatives and guidelines for developing a rational system for making technology choice decisions.

The Commonwealth Secretariat, London, has entrusted ASCI with a research study on Criteria for Technological Choice Decisions. This research is simultaneously carried out in four countries—England, India, Nigeria, and Fiji—and are in different stages of development. Studies on the governmental mechanisms of technology choice will be first done at country levels and then integrated to derive policy imperatives and guidelines for developing a rational system for making technology choice decisions.

For developing countries, in view of the scarcity of some of the critical resources, in the long run, the cost of wrong choices in the area of technology will be substantial. Along with other developing countries, India, in different areas of her activities, has to choose from technologies that the developed countries of East and West have to offer as well as those inherited and also from those capable of developing on her own. Indian official thinking as reflected from time to time in the Five-Year Plans evolved from fuzziness in the Second Five-Year Plan (1956-57—1961-62) to a high degree of articulation in the draft Five-Year Plan for 1978-83. In all the Plans, traditional and small-scale industries as concrete forms of labour-intensive technology claimed a significant share of the total resources. The following passage in the Second Plan conveys the impression that the scope for choice exists only in limited areas : "in many cases the choice appears to be obvious. For instance, in the case of heavy industries, under some circumstances, mechanisation of agriculture, construction of roads, housing, railways and the like have an existing pattern of use of technology...this pattern will have to continue...irrigation and power projects, the choice is determined partly by technical considerations and partly by conditions of labour supply in the area...It is only when we come to the production of consumer goods that the choice between techniques of production may raise difficult issues".

Objectives

The objectives of this study are :

(i) to review policies and practices in the area of technological choices, both in India and the countries

that offer competing technologies; the review will also cover all matters relating to Patent Laws

(ii) to provide an analysis in the context of a project or an enterprise; how decisions on matters of technological choices are made; this will include how options are perceived, analysed and processed at various levels, including within the concerned organisations and the government. The analysis will also cover the role of multinationals and 'donor' countries

(iii) to buttress the preceding analysis with illustrations from a wide range of activities. In the study of specific cases, one of the aims will be to highlight the implications that were missed, particularly the social and political ones

(iv) to identify the part India has played and can play in evolving, adapting, and trasferring appropriate technologies to the developing Commonwealth countries.

Problems

The first part of the Study deals with the problems of choice of technology.

In the last fifties and the early sixties, a sort of disenchantment with GNP as a measure of well-being of a community in western societies led to the search for alternative concepts that included quality of life, social indicators of development, etc. Among the principal sources of disenchantment were inequitable distribution of income, wealth and power, the environmental pollution and destruction, the almost total neglect of public goods and services, the unmixed pursuit of material gains, and the widespread feeling of alienation and neurosis. Without much formal analysis, the source of some of these phenomena can be traced to the nature of technology in its broadest sense. It was felt that assessment of technology (TA) would go a long way in "increasing the social benefits and decreasing the problems generated by technology through analysis of those effects in advance of technology assessment". Some prescribed a more "comprehensive" role to it by stating that "the real function of TA is the improvement of social content and human relevance of technology to increase the rationality of the decision taking process." The TA was thus conceived "as an activity to provide information about, and systematic analysis of, the internal and external consequences (short, medium and long-term) for a society of the application and diffusion of a technological capability into its physical, social, economic and political systems. The information and systematic analysis is to be so structured and presented as to aid the decision-makers charged with responsibility of operating those systems."

A number of sponsored studies have raised interesting questions and suggested varied approaches. Most of these studies do not confine to assessment for the purpose of choice but suggest intervention by public authorities on various points; some of them analyses and recommend forms of supporting action on the part of public authorities. The questions cover a wide range of issues: the nature of technology and its likely future growth, the manner of its application, the secondary and tertiary consequences, costs and benefits, the groups that are likely to be affected and how decisions should be taken. In order to choose a technology, answers to most of these questions have to be supplemented by well articulated societal goals and their

translation into policy instruments to influence the choice decisions by the organisations. This apart, most of the conclusions of the TA studies do not appear to be useful from an operational point of view. Any assessment or evaluation involves, besides the evaluation of the related factors or variables, their behaviour over time and, if possible, their quantification and evaluation. The relevant variables can be looked at as input and output or impact variables. An agreement on their list itself is a problem; their forecast, measure and valuation in cases that have provoked social concern is thus not an easy task. Those who have to exercise technological choice seldom postpone their decisions until these difficulties get sorted out. Informal analysts and 'informal' knowledge, embracing limited number of variables guide these decisions; as a consequence, the process of decision-taking themselves assume a different character. These are the considerations that persuaded Haderman to conclude that "in view of the lack of knowledge about social system, there is no basis upon which to answer that TA Calculus is superior to the political Calculus." However, if we endorse his suggestion that there should be prioritisation among the candidate-areas of TA and various components of TA analysis, it is certain that the quality of choice decisions will be enhanced irrespective of the processes of decision-making, whether they be political or non-political.

The second part deals with the question of nature of technology. Any choice situation presupposes the existence of alternatives and a set of criteria to facilitate the ranking of the perceived alternatives, followed by the selection of the one that is most appropriate or desirable. The nature of technology has been analysed to give a conceptual treatment to the possible issues and the framework of analysis.

There has been a number of studies relating to the choice of technology under Indian conditions. A majority of them deal with specific cases of manufacturing technology and its comparative capital and labour intensities. The major studies on foreign technology in India deal with only one aspect of the complex problem, namely, relation between capital and imported, technology, the comparative cost advantages of foreign technology, and lack of linkages between foreign and indigenous technology. Though the studies are comprehensive in themselves, none of them discuss the dynamic nature of the technology and the lack of a long range plan for technology through a systematic choice of technology procedure at the government level. What is more, the literature merely considered the decision wheather or not a foreign technology is indispensable as a problem of bureaucracy, and not as a dynamic technical problem. Though information on alternative technologies has influence on choice of technology, the existing system of decision-making at the government level has not considered this as a major area of concern. In a different area—inappropriate choice of technology—the literature is replete with studies on high-yielding varieties of strains. However, here no systematic analysis seems to have been made on the process of choice of technology. On the whole, as indicated in the objective, the existing literature has analysed in its entirety the complex problems of indigenous technology, its utilisation in industry, import of technology, choice of technology and the development of an integrated choice of technology system.

The third part of the study discussed the technology policy of India as it has

emerged over the years. The next part analyses the governmental decision-making structure for the choice of technology.

The last part contains a suggested method of evaluation of technology alternatives and the role the involved governments and international agencies can play in choice process which can help increase the rate of technology transfer and the economic growth.

The study in its final form will contain five research cases :

1) On choice concerning family planning technology. The criteria adopted as well as an evaluation of the alternative technology will be discussed in this part.

2) In the area of high-yielding varieties technology, namely, criteria for choice, dissemination of technology and impact of the developed technology as well as its indirect socio-economic implications.

3) The choice of process concerning the 500MW thermal power plant technology.

4) Numerical control machines represent a fast changing and a high technology area. Using technological forecasting, the decision-making process has been refined. The case highlights the need for strong technology anticipation structures in developing countries so as to help them in identifying and evaluating future development options.

5) Leather technology represents a traditional sector. Technology decisions in a decentralised sector needs the involvement of an agency which works for the dissemination of technology. The choice parameter and the decision-making mechanism is likely to be different in this case.

The initial analysis and cases will help us in understanding the governmental decision-making mechanism in relation to choice of technology. □