The Roles of Government, Industry

Government can provide public-sector technology, but government role in private-sector technology can only be indirect

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In the broadest sense, "technology transfer" describes the process by which we move technology from where it is developed to where it is used. It is the classic continuing problem of industrial research within each individual company. More frequently, the phrase is used to describe the process for moving technology from one company where it is being used to another company that wishes to use it. The skills for accomplishing this are presumably the professional basis for the existence of this organization.

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In recent years, the phrase has been applied to moving technology from one *country* in which it is in use to another *country* that wishes to use it. And while this situation could apply to other western countries or to the U.S.S.R. and the Soviet bloc countries of eastern Europe, there is a growing focus on our use of technology to aid developing countries.

Since each particular technology is used not by a whole country, but rather by one or more specific companies within that country, the government's role in any transfer process would seem to be questionable. However, any situation involving a foreign government is indeed a unique area of government responsibility to some degree. How can we define what that degree is, and evolve efficient mechanisms for transfer?

I would like to creep up on this question indirectly, then go from the general to the specific. More accurately, I will make some general comments on government's role in our *domestic* technology developments, suggest several principles that can be observed in that area, then make these the basis for some equally general comments about government's role in the field of *international* technology transfer.

U.S. Government

As we review the increasing U.S. government activism in technology from World War II to the present, it is instructive to ask the question: In what areas and under what conditions has government involvement in technology been most effective? There are several answers possible, depending on how we measure effectiveness. Nevertheless, as a generalization, there have been many examples of sweeping technical progress accomplished and put into use in those areas where the *government itself* has been the final customer. Mili-

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tary applications and space technology are the prime examples, but one could also add jet planes, computers, special high-temperature alloys, and so on.

In these areas, the government set specifications, controlled the interactions between the technical sources and the manufacturers, financed the entire operation from research through manufacturing, and established the market by placing the final procurement orders. All activities from development through manufacturing, including the transfer process, took place within a closed government system. The private sector became involved only as a contractor, although a vital communication process evolved to provide the needed efficiency. No outside market influence or investment difficulties were present.

Since 1970, our government has attempted to use science and technology as tools in the solution of problems in the civilian sector. Domestically, these concerns focus on economic growth, on transportation and housing, and on such broad national needs as materials and energy. These have led to the often repeated string of questions that begin with: "If we can put a man on the moon, why can't we . . ."

The simple answer is that in these areas the government is *not* the final customer. Private companies must decide to make investments, to manufacture, and to distribute, and private citizens must decide to purchase the output at a price. Regardless of technical progress, regardless of government support for research and development, the process of transfer and the process of use are outside the direct control of government.

Adequate Allowance

Thus, government involvement in civilian sector technology can only be effective in the true economic sense when there is adequate allowance for the planning inputs, the management skills, and the investment of the private sector.

We are beginning to recognize these difficulties in the domestic arena. We also recognize some of the political obstacles that must be overcome in order to

permit workable mechanisms for cooperation between government and industry. Profound changes in political philosophy may be needed in order to permit industry decisions to influence government programs and vice versa, while maintaining the independence of both parties.

We can thus identify within a completely domestic American framework the difficulties of achieving technology transfer from our own government support of R&D to our own civilian economy. It is hardly surprising that precisely the same difficulties for almost the identical fundamental reasons occur in technology transfer to developing countries. Let us now see if we can successfully transfer our understanding of the domestic difficulties to enlighten our view of the North-South situation.

The fundamental question at the heart of this subject is: How can our government engage in negotiations with foreign governments about technology that belongs to the private sector?

One answer is that our government doesn't — directly. The problem is that many countries *believe* that our government can and should do precisely that. This in turn leads to pressures on our diplomatic representatives to consider conditions for trade and aid that can serve to establish *indirect* terms for technology transfer.

There are enormous differences, of course, in the government's role related to the several broad groupings of countries with which we transfer technology. Our dealings with other western countries are governed by a body of established practices and agreements which, however complex, are accepted by all concerned as a framework for operations. Our involvement with the Soviet bloc is so intertwined with national security and domestic politics that a consistent set of economic guidelines is difficult to establish.

Thus, the principal arena where policies for technology transfer are being evolved, and on which world attention is focussed for many reasons, is in the so-called North-South interactions — relations between the developed and developing countries. While there is much sensitivity, much antagonism, much likelihood for political confrontation in this area, there is also great opportunity to achieve some realistic positions of benefit to both North and South. Our government has a major role to play in this development in order to achieve a realistic foundation for progress without stimulating unrealistic expectations.

In order to appreciate the separate roles of government and industry, let us consider the different objectives of developing countries in which technology can contribute. For convenience, I will use an analogy with the objectives of a corporation.

Three Objectives

There are three types of objectives that appear to fit a corporation, or a country, and probably many other types of organizations. These are:

1. Strengthen the present base.
2. Expand the present base.
3. Develop new bases.

For a corporation, these objectives translate into particular actions for technology, namely:

1. Lower costs.
2. Improve products for present markets.
3. Develop new products for new markets.

What are the comparable activities for a developing country? Put in the simplest terms, technology can contribute to:

1. Strengthening the national structures.
2. Providing for domestic markets.
3. Developing products for export.

When we consider what might be accomplished through transfer in these several categories, we begin to focus on the distinction between government and industry roles in the process. The first category — strengthening national structures — emphasizes areas such as education, agriculture, public health, training of scientists and engineers. These fields draw upon the technology available largely within the nonprofit or public sector, i.e., from governments and universities. Governments of developed countries have a major *direct* role in these areas of technology transfer because they have access to, and can deliver, this technology.

However, when we consider the second and third categories — providing for domestic markets and developing products for exports — the focus is on active economic growth. These categories involve manufacturing, distribution, marketing. They require the management skills and technology which reside in, and are the property of, the private sector. The government is not only unable to deliver these resources, its representatives are not in a position to discuss in detail how technology can be integrated with the other necessary factors in the economic system in order to accomplish the desired objectives.

Clearly, the first role of government is to keep separate public sector technology from private technology in its planning, its discussions, and its actions. It has a major responsibility to explain this distinction to the developing countries. And it can then proceed to lay the foundation for realistic exchanges of private sector technology.

Primary Goal

How can this be accomplished? It must start by arriving at an understanding by all parties that the primary goal is not acquiring technology but achieving economic balance, i.e., a matching of technology with the manpower, investment and resources that will permit a workable business enterprise and a functioning economy. Our government, and those of other developed countries, has a major responsibility for an educational process, starting with our government representatives and reaching out to the developing countries. This educational process must convey three points:

1. Private companies are interested primarily in establishing a total business relationship, not in transferring technology.

2. Emphasis by some developing countries to "unbundle" technology — to isolate the sale of technology from a complete business package — is a disservice to the developing countries, since it deprives them of an integrated business capability which could install and exploit the technology.

3. The skills required to plan for and adapt technology to the needs of developing countries reside within the private companies of the western developed na-

tions, and could be made available once a workable business relationship is established.

Thus, I see our government's role with regard to private sector technology as primarily that of an educator. This is not with any intent or expectation of converting developing countries to capitalist democracies. Rather, it is intended to identify the nature of what is required to derive benefits from technology, and indicate the role that private companies can play in the overall process. The Soviet government understands these principles very well, and has pursued a great number of technology and business packages with western companies without fear of takeover by the large corporations or losing control of their economy. Developing countries might profit by observing the Soviet approach to the west!

Let me illustrate one specific area in which developing countries can be helped by skills coming from western companies, and which can easily be a point of discussion by our government representatives. Developing countries are emerging into a world of technology, from windmills to satellites. Each country, depending on its resources and objectives, must make choices — choices *of* technology and choices of mechanisms for *acquiring* technlogy. Thus, the first skill that is called for is a technology manager — not an educator, not a scientist, not an engineer — but one who understands and can integrate the contributions of the others.

This skill is the bread-and-butter stock in trade of western industrial research, indeed of the members of the Licensing Executives Society. Just as a company does not have to be self-sufficient in the technology required for its objectives, neither does a developing country. But the skill to identify what is needed, the decision to generate it internally or purchase it outside, and the know-how to carry out these decisions are precisely the approach which any efficient private corporation follows. The need for this skill is easily understood by the developing countries, and our government can play an important role in presenting this need and indicating the potential help available from cooperative western companies with whom they have established a business relationship.

Summary

Let me summarize the few simple points I have tried to make. The needs of developing countries to strengthen their infrastructure can be provided largely from public-sector technology. These can be negotiated directly by government.

The desires and the needs of developing countries to provide for economic growth, both in domestic markets and exports, require private-sector technology and management skills. Our government's role here can only be indirect, and its most useful action is to present a clear picture of what can be available from private companies to aid the needed economic development.

Finally, we note that the separate roles of government and industry required for successful technology transfer from developed to developing countries are directly related to the similar problem of providing for effective involvement of our own government in civilian technology and of its transfer to economic use. We can learn much by observing our domestic difficulties, both technical and political, in this process and applying this experience to the international field. More important, the acceptance of this similarity by the developing countries should make them realize that their difficulties arise from certain fundamental characteristcs of the process by which technology is integrated into the economy, and not primarily because of the political and economic differences between North and South.

The heart of what we are all trying to do is to enable each developing country to evolve a technological growth cycle. What do I mean by this? As we review the history of the western world, we observe that industrialization took place within roughly the same time period as the development of the technology that was part of that industrialization. There was constant strong interaction between these two developments. The growing industry defined needs for technology, set specifications for it, and stimulated its growth. New technical developments found a mechanism in place for exploiting their results, thus providing incentives for further work. A growth cycle was in operation.

It is this necessary interaction between an industrial structure in place and the choice of appropriate technologies to support it and provide a basis for growth that is fundamental to my remarks. One does not simply buy any desired technology, then develop an industry. There must be a hand-in-hand growth, a balance, to provide the feedback that permits stable growth. The skills for doing this are the strength of western industrial research. The technologies that support our industries are the property of western companies.

The role of government is to make these facts clear. The role of industry is to set forth reasonable conditions for helping developing countries to establish their own growth cycle. This, and not technology transfer, is our true objective. In a previous talk on this subject, I remarked that: "Building a technological structure is simply an intellectual exercise. Building a strong and successful economy is a worthwhile human enterprise in which all can contribute, and in which the future can work successfully with the present."