Harnessing Technology Flows

Strategies for optimizing R&D and narrowing the gulf between government and industry

BY J.J. SHEPHERD*

I shall explore the nature and consequences of the new competitive environment in which Canada and the U.S. are situated, to discuss the increasing importance of technology, and to draw some conclusions about the new strategies we need to shape as analysts and practitioners in licensing. I will also inject a few comments about a perceived difference between the Canadian and the U.S. environments.

J. Shepherd

THE CONTEXT

From a political science, and social science perspective, I think it fair to observe that often the first, most articulate expression of a dominant political, social or economic system coincides with the decline and fall of that regime. Plato's Republic, describing the Greek city state, is an obvious example, since the end of that political system was clearly visible during his lifetime. It is my feeling that the current emphasis on free trade is a reflection of that phenomenon, and that the fierceness with which it is advocated underscores the speed with which it is disappearing. In this context, the Tokyo Round of GATT is not the trumpet blast which will reduce the walls of protectionism, but is rather the "Last Post" lamenting the end of a world order, shaped and sheltered by the U.S. economy, in which free trade was believed to be the long-range destiny for that world economic order.

Free trade is feasible when one imperial economy dominates the international trading system. In such a condition, it is in the interest of the paramount power to ensure the free flow of goods, capital, services, and I might add, technology, because the terms of trade are influenced and arranged so as to be favorable to the paramountcy. The period following the corn laws of 1840, registering the industrial hegemony of England, was one such era.

The 20- or 30-year period after World War II reflected an expression and recognition of that principle, as exemplified in the enthusiasm of the United States and other nations to pursue the regular GATT negotiations. But at the same time, there existed a keen appreciation, by the rebuilding economies such as Germany and Japan, that nationally orchestrated and indubitably "unfree market" measures would need to be evolved in order to develop trading strength and better balances of payments and harder currencies. Although careful, of course, to maintain an appropriate terminological distance from the planned economies behind the Iron and Bamboo Curtains, many of the

Western nations, along with Japan, began to evolve distinct economic and industrial strategies which were clearly centrally planned and directed, and which were all essentially similar in nature. To varying degrees, all these strategies were based upon consciously constructed partnerships between the public and the private sector and related to clearly articulated national goals of economic development. In the course of their implementation, so many of the strategies and policies so familiar to us today came into being: regional development incentives, protection of the domestic market through non-tariff barriers, government-to-government trading negotiations, research and development incentives, strategic pricing, and the voluntary and permitted growth of major cartels. All of these can be described as highly discretionary instruments aimed at strengthening the national industrial base.

New Pattern

This wide range of economic and industrial policy instruments, which those of rather classical economic outlook still tend to think of as aberrations and isolated malfunctions in the system, have now in fact become the new global trading pattern. Michael Hudson's book "Global Fracture" describes this process quite vividly.

In the main, moreover, although again some may tend to think of the process as disruptive, it has proved to be extremely successful over extended periods of time. Sweden, Japan, Germany, France, and others, have rebuilt their economies to the point at which, in various industrial sectors, and in various fields of technology, each has established a strongly competitive position relative to a previously overwhelming North American leadership. The case is undeniable and the multiplicity of everyday examples does not need to be enumerated. "Reverse flows" of advanced technology are already occurring in automobiles, instrumentation, automation and other areas.

The Third World has not been slow to learn from the example, and to emulate the so-called "Japanese model". The arrival of Brazilian auto parts in North America, is as much the portent of new competitive

**Vice-Chairman, Science Council of Canada.*

trading pressures as was the destruction of our indigenous consumer electronics industry or the arrival of Japanese snowmobiles.

The points behind this perception of our new competitive environment are twofold:

First, despite a legitimate nostalgia, any strategy — economic, industrial or technological -- which rests upon the assumption of restoration of the classical free-market economy is not only historically incorrect but also consciously irresponsible.

Second, from a western industrial standpoint, the critical currency of the new trading system is that of technology. Under the onslaught of low labor costs applied to large-scale production, and of strategic pricing policies, perhaps the only competitive edge remaining to the Western economies is that of technical know-how, the more advanced product, the more knowledge-based service, the more automated line. We are being pushed rapidly and remorselessly up the technological ladder at the cost of keeping market position. The implications of this process, in terms of accelerating research-intensive activities, in terms of specialization, in terms of broad innovation and industrial policies, are enormous. They are not as yet being accorded sufficient attention in North America.

THE U.S. ENVIRONMENT

It is somewhat ironic, that, coincident with the new emphasis upon industrial, technological thrusts in other nations, the U.S. should have witnessed, until quite recently, a period during which the impulse to technology-based innovation actually declined.

This audience in particular will be well aware of the data compiled to paint this picture. A declining share of patents, the low level of nonmilitary research and development expenditures, the absence or dearth of new equity issues for small innovative companies, the increasing amount of R&D effort applied to regulatory response rather than new market opportunities, the growing percentage of corporate R&D applied to product improvement rather than to longer-term research. All of these characteristics have spelled a fatal slowing down of the one essential revitalizing process of a modern industrial system—the propensity to innovate.

Over the last few years, under the pressure of currency depreciations, recessions, and trade balance problems, the gravity of this structural defect has begun to surface with increasing frequency and in a variety of ways pressure for change has developed. At the macroeconomic and trading level, the language itself is beginning also to change, heralding an inevitable shift in ethos and in values, heralding a legitimization of future major shifts in public policy. Free trade is now becoming "free trade with ground rules", or more daringly and honestly, "Fair Trade". "Voluntary quotas" are being deployed. "Orderly marketing" is a legitimate expression.

In R&D policy, the U.S. federal budgets are beginning to put more emphasis on intensifying basic research activities. In a broader context, we have but very recently concluded the White House initiated review of incentives and disincentives to innovation. These various activities are different facets of a rapidly developing attempt to stimulate technological activity in the United States and to recover industrial momentum and competitive position.

As always, such a thrust has its negative as well as its positive overtones. There have been indications that organized labor has associated the transfer of technology abroad with the export of job opportunity. Some of the military export programs seem to be generating restrictions on the export of such information as might confer subsequent commercial advantage to the buyer. (Canadian military reawakening emphasis on R&D is due in part to the need to have "something to trade" in the international technology pool.) The Bucy report on the protection of sensitive military technology seemed to imply that commercial as well as military issues might be involved. Certainly there is an atmosphere prevalent which insists that technology transfer be measured against economic impact, at levels wider than the specific corporate commercial transaction.

TECHNOLOGY TRANSFER

This heightened awareness of the relationship of technological effort and economic well-being has begun to impact upon the preception as to its importance as a wasting asset, upon the control of its exploitation, and upon policies and modalities of its transfer. In this context, the licensing executive becomes the financial intermediary in the new international currency, technology. How he manages that flow, in terms of both disposal and acquisition, is as vital, if not more so, to corporate health as is cash flow, with possibly even deeper and longer-term implications. How he is governed or affected by the background policy and regulatory framework established to rationalize this flow will be vital to national health as well as to corporate viability.

The operational network is complex. Although traditionally the focus of technology licensing has been the inter- and intracorporate transaction, it will increasingly emphasize other channels.

One might note in this connection the importance recently being placed upon university research as a source of innovation. If ever there was an institutionalized and attitudinal bloc in the technology transfer system, it exists between the universities and industry, probably much more so in Canada rather than the United States for reasons of foreign ownership. There is also the flow of technology transfer from government laboratories to industry, again fraught with both organizational and attitudinal difficulties.

Disclosures

There is also the issue of disclosures in large corporations of new inventions which may not be directly pertinent to the corporate mandate. These have been previously ignored, but are now advanced for external exploitation because of the new found commercial value and importance of the asset. In other words, from international levels down to the smallest of business enterprises, and across an entire spectrum of activity from test methods and production processes to the purest of research, there is a rapidly expanding network of technology transfer activity, vibrating with a greater and greater sense of urgency.

In parallel with the widening of the technology transfer system, is the increasing complexity of the fiscal and regulatory environment as specific attention to technology per se develops. One instance in Canada, an instance which has parallels in other countries, relates to the Foreign Investment Review Agency. In analyzing the impact of a proposed acquisition of a domestic company by a foreign concern, it is required to assess whether the development of indigenous technology will be enhanced or impeded by the acquisition. In the fiscal area, the corporate income tax provisions for small business contain a specific disincentive in relation to the licensing abroad of technology. This occurs in that "license" income is regarded as nonproduction income and is therefore treated at the high rather than the small business tax rate.

This kind of statutory and procedural intervention is bound to increase as technology generation and flow become an essential element of evolving industrial and economic strategies, and as it becomes even more evident that technological strength is linked closely to employment opportunity.

TECHNICAL INNOVATION AND INDUSTRIAL POLICY

This notion of the coupling of technology asset management, of the transfer and licensing of technology, with industrial strategy, is I think crucial to an understanding of where policy is going. In both the U.S. and Canada, through the work of Boretski, Dennison and others (including our own Canadian Ministry of State for Science and Technology) we seem to have achieved the linkage, to the satisfaction of policy-makers, between:

- R & D and economic growth at the national level.
-Research intensity and growth at the corporate level.
- Research and domestic ownership.

Out of these linkages stems a realization that any policies aimed at building or strengthening industry must be so shaped as to influence industrial R&D, i.e. there must be specific technology strategies. This is why the Liberal Government announced, in 1978, its famous target of 1.5% of GNP to be spent on R&D by 1983, and why the Conservative Opposition promptly advanced the same target to 2.5%.

In this connection, I might note, that an ad hoc committee reporting to the Minister of State for Science and Technology, a committee of which I had the honor to be Chairman, recently published its brief. It referred to the variety of measures which might be deployed to enhance our national R&D activities. These included the shaping of federal and provincial purchasing policies toward the strengthening of indigenous R&D, the use of more generous tax incentives, the encouragement of multinationals to move to the assignment of world product mandates to their subsidiaries, and the optimization of imported technology.

All these measures have an obvious bearing on the scale and flows of technology. It is likely, in my view, that policy thrusts will be developed in most of the areas to which the committee drew attention.

The more we respond to the international environment which I have described, the more we begin to orchestrate our own embryonic industrial strategies, the more we will begin, of necessity to control the generation and exploitation of technology. One cannot, in other words, discuss the licensing of technology outside the framework of industrial and economic policy.

It is this linkage which brings in the notion of government as the "Big Brother" and which allows me to tackle the absurd notion of a fundamental polarization between government and industry.

If there is one basic building bloc characterizing the successful competitive trading challenge posed by other countries, it is that of a concerted and harmonized deployment of available strengths and resources by the public and private sectors. Japan Incorporated is the extreme example. Based on my own trading experience, there is an issue of degree but not of principle between Japan Incorporated and France Incorporated and Sweden Incorporated, to cite but two of many.

To suggest that such a concert is not feasible in North America is an insult to our native intelligence and innovative instinct. To assert that it is not desirable as an ethic is as myopic as it is ludicrous. In both the United States and Canada, there is need for mechanisms and processes which fuse industry and government into productive partnerships, with each actor contributing according to agreed goals and respective capacities. We simply do not own the plenitude of resources, both material and human, in a violently competitive world, to enjoy a polarized approach.

I might note in parenthesis Walt Rostow's comment, reported in Business Week of September 10, and dealing with the subject of energy policy, "The necessary alterations in the pattern of investment will not occur without conscious government policy", which, the magazine observes "means a much higher level of government economic planning than Americans are used to". The only important point, from an ethos point of view, is that no one effectively admits that such a level of government intervention is overtly recognized. As Mr. Irvine Howe observed, "The welfare state was introduced almost on condition that it not be named."

In this context, the concept, or perception of Big Brother by the private sector, does great injury to the need for cooperative endeavor. No one can, or is wishing to deny the argument that we need less government. But the simplistic onslaught on size entirely obscures the great need to ensure that what government there is must act coherently and cooperate efficiently with the private sector. One can only express the hope that we in industry convert rapidly from castigating and fearing "Big Brother" to one of achieving a positive interface with a national partner.

THE CANADIAN SCENE

The problem of competitive industrial base, of an intensification of R&D activity, of technology optimization, is difficult in an advanced industrial economy such as the United States. In a country such as Canada, with deep structural problems, it is monumental.

One of the alarms raised by the Science Council some years ago bore upon the weakness of the process of industrial innovation in Canada. It traced that weakness to a variety of causes:

— The frailty of the manufacturing sector, particularly in the area of finished goods.

— The lack of balance between mature and high-technology industries.

— The low research intensity of foreign subsidiaries.

— The difficulty in a federated state of generating orchestrated remedies.

— The lack of forward and backward linkages from our resource sectors.

These structural weaknesses were, in our view, the cause rather than the result of extraordinarily low levels of research and development effort, of poor productivity, of lack of competitiveness resulting in, for instance, the world's highest per-capital level of imported goods and a trade deficit in imported goods that has gone from 11 to 12 to 17 billion in spite of a dollar discounted by 15%.

It was also our contention that the problem could not be cured by anything but a direct attempt on the revitalization of the manufacturing sector, through rationalization, specialization, intensification of R&D, and all those other policies which I have previously described as the foundation of industrial strategies in other countries.

The policies for revitalization which we at the Science Council have advocated have their obvious impact on R&D activities and on the emergence of specific technology policies.

1. Purchasing policies shaped to technological enterprises. Contracting-out is a typical example.

2. The stress on domestic ownership to promote research because of the relationship between ownership and research intensity.

3. Emphasis on military offsets which are of high technological quality. The new fighter aircraft and Canadian patrol frigate programs are typical.

4. The encouragement of world product mandates for the subsidiaries of multinational corporations.

5. More stress on the control and exploitation of imported technology. As noted, the Gray Report on foreign ownership raised this issue.

6. Better flows of technology from the university research base to industry as exampled in the innovative "Action Concertee" program in Quebec.

These are all policies which we feel are essential for Canada and which will affect directly the sphere of activities of this audience.

I will not try to outline to you the precise forms that these policies and mechnisms should take. You are experts in that area. But it is my sincere conviction that these policies, calling as they do for a significant level of coherence in public policy, are rational, essential and inevitable in the Canadian circumstances. They may also become more pressing and relevant, even in the wider North American context.

As the competitive environment becomes more severe, as our own attempts to develop an equally competitive response become more focused, so the need to harness and optimize technology flows will become greater. In this context, the licensing executive will be faced not only with demands of greater urgency but also with demands and needs of an increasing variety and complexity.

This profession must become more aware of those national needs and opportunities, perhaps more attuned to the dictates of political economy and also perhaps more sophisticated in their response to such a challenge. In a period of enormous change for North America generally and for Canada in particular, this audience faces exciting and challenging prospects.