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ACHIEVING COMPETITVENESS IN CANADIAN HIGH TECHNOLOGY INDUSTRY

BY

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INTRODUCTION

One of the most topical subjects arising out of the prolonged recession facing the country is that of Canadian competitiveness and particularly the question whether Canadian industry can compete in the ever developing global economy.

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It is generally accepted that Canada can no longer depend on its natural resource wealth to continue generating the standard of living to which the country has become accustomed. As the world price of commodities continues to decline, other sources of wealth generation are required in order for Canada to retain its economic prosperity. Considerable emphasis, and hope, has been placed on the role of "knowledge based industries" where brain power is the natural resource used to harness high technology into a vehicle for wealth generation. However, the R&D intensity of Canada (with an expenditure of only 1.3% of its GDP) puts it in the same league as Italy, Australia, India, Taiwan, Yugoslavia and Austria. This is about half that of the industrial leaders in the world, notably U.S.A., Japan, Germany, France, U.K., Sweden, Netherlands and Switzerland and is even behind that of South Korea. Thus the R&D current base and intensity in Canada is not one that is likely to give us any significant competitive advantage.

The purpose of this article is to contribute to the discussion on how world competitiveness might be achieved in Canadian based high technology industry. The views expressed here are conditioned by a number of years of experience associated with a highly R&D-intensive (science and eng'g) commercial activity based in Canada. Suggestions are made regarding appropriate roles for industry, government and universities in the goal of achieving world competitiveness.

INDUSTRY

Industry is the only real direct means to generate wealth and hence it must assume the prime responsibility to be able to compete in international markets. Considering the decline in real growth of large corporations worldwide (as contrasted with mergers and acquisitions) and the fact that small and medium sized companies are usually far more innovative than large organizations, the development of high technology Canadian-based small and medium sized companies will become increasingly important for job creation in Canada.

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Two other international trends are also to be observed. Firstly, the R&D strengths of a country are increasingly in its industrial companies. This has been long the case in the U.S.A. but is equally evident in the evolution of Japan as a world industrial power. Secondly, the trend is more and more towards "concurrent R&D" where the research team and the development team work in parallel and in close concert towards well defined goals. The prior model with research eventually finding its way into development and then into a product or service is not in tune with the demands of today's customers nor with the pace set by our competitors

For Canadian high technology industry to achieve and sustain competitiveness,it is important that their business strategies encompass the BASICS. These include:

Business Niche - It is important that the markets are real, that the competition is manageable and that the niche is exploitable from Canada. The identification of an appropriate business niche is probably the most important challenge facing a Canadian enterprise. It requires an intimate on-going knowledge of customers and of technology. In particular, market development is almost always very expensive and entails high risk.

Every business must have a competitive advantage.

Competitive Advantage - Every business MUST have a competitive advantage. This could be cost, quality, uniqueness, coupling to a natural resource, etc... or several of the above. Most importantly, the business must realize that it has to create its own competitive advantage. If success needs to be based on availability of a government subsidy, then the business is likely living on borrowed time.

Staying Power - Virtually all business development takes longer than originally planned. The resulting consequences are increased cost and possibly loss of opportunity. This can be disastrous. Hence any appropriate strategy must ensure that the business plan is biased for MAXIMUM STAYING POWER.

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International Competitiveness - The profile of nearly all successful Canadian high technology companies shows that at least 50% and, more likely, something like 75% of their business is for export. The competition is therefore international. To prosper, it is essential that the business be ONE OF THE BEST IN THE WORLD.

Ability to Cope with Change -Many business plans and approaches are based on the assumption of a relatively constant situation. However, history shows that there is no such thing as a steady state. In fact, the greatest certainty is that there will be change. This is evidenced by observing the ever changing world economic situation, the world political changes, the evolving world trading environment and the advances in technology. Hence any successful business strategy must be receptive to new ideas and new initiatives and have the flexibility to anticipate and react successfully to change.

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Synergy - In order to be successful a high technology commercial enterprise must have ALL OF THE ABOVE BASICS working for it in its business strategies.

GOVERNMENT

Typically, a high technology company's expenses on "person-power" may be as much as 75% of its sales volume. This highly trained work force is likely to pay personal taxes in the range of 35% to 40% of their salaries on average. Governments, therefore, have a return in the form of the personal income tax from the jobs created of the order of .75 x .35 = 26% of sales.

From the above example, it is obvious that HIGH-INCONE JOB CREATION is the real pay-off to governments. The appropriate goal of an industrial strategy is thus equally obvious, namely: to create as many successful knowledge-intensive Canadian based multi-nationals as possible.

Governments have a number of instruments available to aid the development of successful high technology based industry. These include the following:

Technology - A considerable amount of technology is generated by government laboratories such as those of the National Research Council (NRC), the Department of National Defence research centres, the Energy Mines and Resources laboratories, etc. A greater focus and closer coupling to industry is essential if government laboratory activities are to be of economic significance. The "shelf life" of technology is continuing to shrink. Therefore, there is an urgency to exploit the results of R&D or face the conseqences of obsolescence or, more likely, the entrenchment in the market of a competitor.

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The current trend of government laboratories to move toward a cost recovery basis of interaction with industry is almost certainly doomed to failure. The real payoff to government is in the resulting job creation. In fact giving away the technology in order to have it exploited from Canada would be a good investment.

Procurement - There should be a concerted effort to use government procurement to give Canadian industry the opportunity to take a development from the research stage to the product stage. This is the role played by most foreign governments for their industries and anything less by Canada puts its industry at a disadvantage. Most importantly, a synergy is required between the policies of different government departments, notably Industry, Science & Technology, Defence, Communications, Energy Mines and Resources and the Canadian Space Agency in order to foster the development and growth of an internationally competitive home industry.

Indirect Assistance - Canada claims to have the most generous system of tax credits for industrial research in the entire world. Unfortunately, in many cases highly R&D-intensive small and medium sized companies are unable to use these tax credits in a time frame that is advantageous to them. Frequently, large corporations who are not as R&D intensive are able to take full advantage of the tax credits while small and medium sized companies who are very R&D intensive are not.

The solution to the above inequalities is straightforward. Namely, raise the annual deduction limit to say $1 million provided the company does a certain % of R&D compared to sales), remove the limit of 75% of annual company earnings and, in the case where the company is not sufficiently profitable to gain a tax credit on its net income in any given year, make the tax credit a real refund to the company (as is the case for Quebec tax credits now). These moves would have a significant influence in stimulating self-investment in R&D by small and medium sized high technology industries and go a long way to providing equity capital from earnings.

Direct Assistance - From time to time governments identify critical areas for direct assistance. The key criteria should be the export track record or potential of the company, its job creation track record or potential, its future business plans and its investment of its own hard earned cash. Such a program would directly assist industry in the directions industry wants to go - an essential for the optimization of success. The first step in help must be self-help. The second step is acceleration of successful development.

A key ingredient for the success of any government support program is ease of administration. This would call for more authority resting with the administrative officers, and less use of the cadre of current ubiquitous committees. Such a process would create a generation of quality administrative officers capable of meeting the challenge facing the country.

A further requirement is the need for long term projects, fine tuned as experience determines better processes, but of a duration that industry can count on in its long term evolution.

UNIVERSITIES

The main "product" of Canadian universities, is highly educated people. These are invaluable to Canadian industry. My experience is that the graduates of Canadian universities are very well schooled in the fundamentals. Their orientation to the business world and to commercial competitiveness leaves much to be desired. This reflects the lack of adequate interaction between university staff and their industrial counterparts. The influence of the university and their teaching has been dominant in forming their attitudes.

There is no question that numerous Canadian university researchers are of world class and perform work which is recognized as at the leading edge in the current literature and in contemporary symposia. Their publication records are excellent and conform in an exemplary way to the reward system in place in most universities. However, an additional question is, "How can this research be exploited for the economic benefit of Canada?" Here the answer is not obvious. It is easy to say that high tech industry is not well developed in Canada and hence this coupling is poor. However, there are significant numbers of world class innovative industrial organizations in Canada. How good is the coupling to these ?

> *How can university research be exploited for the economic benefit of Canada?*

There is a very significant investment by the country in university R&D through the Centres of Excellence programs. A number of groups have received major support for determined periods of time in anticipation of a significant economic payoff from this major increase in support of university R&D. On the whole, I believe that the net result from a number of these centres will be disappointment in the direct economic benefits achieved. This is primarily due to the fact that the support of these Centres of Excellence has been based on the linear model of innovation which expects a progression from basic research through development and finally into production and exploitation. This model is not well supported by events in the current real world. The competitive real world is NEED DRIVEN with a surplus of

available technology. Unless there is a close coupling between academic research and industrial needs, the academic research will continue to be diverted to areas of little commercial significance.

There are, of course, notable exceptions where there is close coupling between the academic research and industry providing the potential of important economic results. Models such as that offered by Precarn, where the R&D is industry led and managed while insuring a close academic involvement offer a much higher probability of success measured in economic return.

Not the least of the deterrents is the university reward system which recognizes scientific progress and publications at the expense of academic-industry interaction and contribution to industrial wealth generation. Until this system changes the coupling is likely to remain weak and dependent primarily on the initiative of individual university professors.

Collaboration in real terms is likely to be best achieved with a limited number of partners which consist of knowledge generators(universities), non-competing knowledge users (industry which buys solutions for its needs) and non-competing knowledge producers(industry whose business is to use technology to serve the needs of customers such as the knowledge users).

CONCLUSIONS

Canada has a dire need for wealth-generating, knowledge-intensive industries as the economic wave of the future. A key industrial policy must be the fostering of an economic climate to grow the maximum number of Canadian-based successful multinational corporations. This approach will depend heavily on the performance and growth of small and medium sized Canadian companies.

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Success requires a determined effort by government, by universities and principally by industry. Canadians must:

Foster commercialization - including emphasis on technology transfer by universities and government laboratories to industry, and the development, with appropriate government assistance, of competitive small and medium sized business.

Mitigate against underinvestment - including adequate support of the development of relevant technologies in the universities and appropriate tax credits and other means to support, in a timely manner, the efforts of small and medium sized business.

Reward success- recognizing, by career path acceleration, contributions by university researchers to industrial commercial success and recognizing in an economic and commercial manner the risks taken by entrepreneurs.

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