

CANADA'S INNOVATION DEFICIT

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The Science, Technology and Innovation Council's State of the Nation Report confirms Canada's underperformance in innovation. Data indicates that our nation suffers from low business R&D, and poor business-university collaboration, and that Canadian universities lack international visibility. But all of these problems are symptomatic of a larger, overarching problem — the need for Canada to grow its talent, promote forward-thinking leadership and develop a coherent and robust vision for innovation.

Le Rapport sur l'état de la nation du Conseil des sciences, de la technologie et de l'innovation est venu confirmer la médiocre performance du Canada en matière d'innovation. Ses données révèlent ainsi plusieurs faiblesses au chapitre de la recherche-développement d'application commerciale, de la collaboration entreprises-universités et de la visibilité internationale des universités canadiennes. Autant de lacunes symptomatiques d'un problème plus global : la nécessité pour le Canada de développer ses talents, de favoriser un leadership prospectif et d'élaborer une vision forte et cohérente de l'innovation.

Canada's *Science, Technology and Innovation System: State of the Nation 2008* is the latest of four publications that document Canada's preparedness for the knowledge economy of the 21st century. True to our country's often middling ways, these reports are neither apocalyptic nor enthusiastic about our nation's positioning, but for a privileged First World country they sound a disquieting note about our prospects for the future.

In 2006 the Council of Canadian Academies observed that despite our strengths in research, we do not do well in converting strength in basic science into commercial success. This deficiency in our innovation system also troubled the Conference Board of Canada, which ranked the country poorly in innovation, and the Competition Policy Review Panel, which urged a competitiveness agenda that requires greater productivity, better innovation and a more entrepreneurial culture. There is a growing consensus among informed observers that Canada is deficient in the culture of competitiveness that stimulates innovation and in turn inspires productivity.

It is in this context that Ottawa's Science, Technology and Innovation Council (STIC) presented its *State of the Nation 2008* report. It presents an overview of Canada's science, technology and innovation system, charts our progress over time and compares our performance with that of science, technology and innovation leaders around the world. It also suggests areas that must be addressed if we are

to raise our sights to levels of achievement that would place us among the globe's most innovative countries.

First, the overview: Innovation success is essential to our prosperity and quality of life. Canada has capacity and advantages that should position us well for leadership in innovation, but we are falling well short of our potential. The current economic situation should stimulate our ambition for greater innovative success, and the failure to heed this stimulus will compromise our progress and standard of living — perhaps permanently.

Ottawa's science and technology strategy emphasizes the pursuit of three advantages — entrepreneurial, knowledge and people — and these assist in the identification of key indicators and frame the comparison of Canada with other First World countries.

Key indicators of entrepreneurial advantage include business expenditure on research and development (Canada has a low ranking); percentage of total R&D performed by business (low ranking); government support of business R&D (high ranking); business investment in machinery and equipment (middle ranking); venture capital investment (middle ranking); percentage of total sales for innovative products (middle); and collaboration between firms engaged in innovation (low).

Knowledge indicators recognize that the share of national R&D undertaken by universities (higher education R&D, or HERD) is very high — second only to Sweden's and well above

G7 averages — but this good news needs to be tempered by a sobering look at the reporting of HERD by Organisation for Economic Co-operation and Development member countries. According to the analysts at the Association of Universities and Colleges of Canada, OECD countries have differing interpretations of the OECD R&D reporting guidelines, which have led to

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misleading differences in the comparison of HERD with GDP.

The *State of the Nation 2008* report indicates that Canada does well in the amount of published scientific research. Of course quantity and quality are not the same, although citation indices suggest that Canadian scientific research is also of high quality.

The reputation of our universities is also important. While Canadian universities rank well in particular subjects and some appear among the top 100 in the two most prominent rankings of the world's best universities, none are in the top 10 on either list.

For scientific research to have maximum possible impact, universities must have strong links to other participants in the innovation chain. Here Canada's performance is mixed. In some industries connections are better than in others and within a particular industry linkages vary among firms. But in general the extent of business-university collaboration is low, and Canadian executives and others are not enthusiastic about the state of university-business collaboration. The number of technology licences is low and spin-off activity is in apparent decline. It is government that is carrying the load for the participation of universities in Canada's innovation system.

With respect to people (talent)

indicators there is some good news and some not-so-good news. Canada has one of the best-educated workforces in the world and some of our younger citizens score well in international science competitions. However, our performance in workplace training is poor. We have high levels of adult literacy problems and low numbers of business and advanced degree gradu-

ates. We have low numbers of international science award winners and of Canadian corporations that sponsor them. We have a poor record in attracting international students. And in percentages of new degrees in math and science, Canada fared poorly in comparison to OECD countries generally, though better than our largest trading partner, the United States.

The report emphasizes the overview, key indicators and comparison, but STIC also recommends areas that require attention if Canada is to move forward in science, technology and innovation. In pursuing the people advantage, the council urges continuing attention to the performance of young Canadians in math and science, and better exposure of young people to international experiences and career opportunities in science and technology development, application, management and financing. To gain a knowledge advantage, STIC urges the focusing of resources on research priorities, including a sustained investment in fundamental research; research standards at the highest international levels of excellence; training students in state-of-the-art facilities; and the advancement of knowledge and technology transfer between engineering, science and business. Securing an entrepreneurial advantage will require greater investment by

Canadian companies in R&D, the hiring of more managers and executives with advanced degrees and readily available sources of risk capital at different stages of business development.

A severe recession in a decentralized federation may not be the most propitious time and place for this report to see the light of day. How deep and for how long are the inevitable preoccupations when growth turns to shrinkage and stock markets lose 50 percent of their value? And in the decentralized federation that Canada is, the development of an ambitious, inclusive national policy is an arduous and often elusive goal. But this report — along with its predecessors from the Council of Canadian Academies, the Conference Board and the Competition Review Panel — should command the attention of Canadians and their governments from coast to coast. The message is clear: notwithstanding some strengths and advantages, Canada is not an innovative country.

Three problems in particular stand out. First, business in Canada is a relatively minor participant in research and development. Second, given the amount of the country's research that is conducted in universities, there is too wide a gap between researchers and innovators. And third, if university research is to continue to fuel the country's innovation, we need to ensure that our universities are internationally connected and among the best in the world.

However, these problems may be more symptom than illness. Low business expenditure in R&D (BERD), the gap between researchers and innovators, the lack of world-class universities — all are symptoms that stem from a lack of coherent and robust vision. Each participant in the innovation pipeline — governments, academia, and industry — is working (with a few exceptions) within their own sector-specific, often institution-specific, purview, and while there are occasional intersections of interests,

these are often two-dimensional, and one off. There are almost no sustained and leveraged partnerships across stakeholders, over significant periods of time.

If we view low BERD as a big-picture “system” problem, it becomes evident that more direct government invest-

ment in business R&D (versus tax incentives) would allow the best alignment of government and industry goals to strategic investment in targeted and basic university research and graduate level talent development. The shared platform for building an innovation society would provide a sense of common purpose for industry-university-government partnerships and address our second identified symptom/problem — the gap between researchers and innovators.

Within our federation, the provinces and the federal government, the universities and the private sector cannot afford to work separately — our geography is too expansive and our population and wealth base is too small to have others take us seriously if we do so. In order for Canada to be an innovation nation, we must coalesce around a coherent action plan. We require a common vision and a commitment to being full partners in our innovation system. We must act now.

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Our current within-sector dominant approach to science, technology, innovation and talent creates a wall between Canada’s researchers and innovators, hurting our country’s competitiveness both nationally and internationally. At a time when we need to build our innovation strategies to link people, knowledge and innovation internationally, we lack the unified strategy and support that would transform our individual strengths into that of a country that is a strong and competitive national participant in distinguished global knowledge networks.

Lastly, all levels of government must recognize the key role of universities in Canada’s innovation economy, and give them sustained, effective means of support necessary to compete on the world stage, while universities will do well to be transparent and performance-driven in fulfilling their mission. Strong, strategic and globally oriented universities

play perhaps the most important role in society today. They create knowledge by generating research, and they serve their regional and national communities by supplying expertise and helping to shape policy. Universities also educate students, forming the talent pool needed to drive innovation. That talent pool runs far deeper than just scientists and engineers, as important as they are. The pool also includes the managers, lawyers, designers and experts in human behaviour, culture and language that are absolutely necessary for innovation to flourish in the marketplace.

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To achieve our shared goals, we need a broad, distributed base of leaders who are grounded in wisdom and authenticity, people who will make the right choices for the medium and long term, even if they are unpopular in the short. Our country boasts bright, talented people — and this is a resource that we must exploit and grow not only to generate the creative and adaptive ideas and knowledge base required for innovation, but also to have the leaders that these difficult times demand. It is a resource that requires increased and

sustained investments. Canada leads OECD countries in those aged 25 to 64 who have completed some form of higher education. However, while our college graduation rates rank first in the OECD, only 24 percent of our working-age population holds a university degree, a rate that lags fully 10 percent behind that of the US. Canada ranks second-last among 17 peers Ph.D. graduates — the talent pool that dominantly drives the innovation economy, in all sectors.

In addition to strong and upright leaders, any new vision for innovation must now take into account not only a worldly experience and global perspective, but how we balance and interweave wealth creation with our social goals, our larger societal priorities and values: concern for our environmental impact, global health and reducing disparities for the disenfranchised, as well as economic stability and growth. The day when social values sit on one side of the ledger and wealth creation on the other is long gone, and effective leaders will innovate new ways of interweaving mutual benefit and progress in these interdependent domains of civil society. Canada is uniquely positioned to excel in this regard.

The STIC *State of the Nation 2008* report has identified Canada’s innovation strengths and weaknesses, a snapshot of where we stand today. Canada is at a watershed. The time is right, and indeed urgent, that we come together and forge sustained strategic partnerships and integrate cutting-edge knowledge, talent and research from universities into business, government and communities in a way that creates and sustains positive economic and social results, bringing strong benefits at the local level, while recapturing a meaningful leadership role for Canada in the world.

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