

THE CHALLENGE OF PROSPERITY: The Role of Research and Development and Innovation in the Province of the Future

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The eighteenth in a series of articles developed from regular public forums sponsored by the Leslie Harris Centre of Regional Policy and Development. Memorial Presents features speakers from Memorial University who address issues of public concern in the province.

Historically, the challenges facing life in Newfoundland and Labrador have been those of an economy of want. Times have been tough, opportunities scarce, successes modest.

Times change. Natural resource production is having a transformative impact on the province. The economy is cause for optimism, rather than resignation. Expectations are high that resource-based economic good fortune will be a springboard to a thriving, knowledge-based economy. The legacy of oil and ore is to be independence from resource rents: technology rather than fish; expertise rather than oil. The challenges that have to be faced in these circumstances are the challenges of prosperity: how to achieve it now that it is within grasp, and how to live successfully with it and ensure that it doesn't wriggle away. Success requires that the provincial society build an apparatus that can deliver on the expectations of sustained economic and social wealth.

One element of this apparatus will be a research and development and innovation (R&D&I) system that fosters knowledge creation and stimulates innovation. This article focuses on the R&D&I system. It describes what it is, identifies some of its important attributes and discusses what might be done to establish a system that can help shape the intellectual and economic landscape of the province of the future.

Research aims to discover. It generates new knowledge and new understanding. The

application of new knowledge and understanding generates innovation and subsequently the wealth to sustain and grow the R&D&I ecosystem and to contribute to the wider society. People are central to an R&D&I system. Discovery and invention don't just happen. They require expertise that is exercised and honed through research activities. The institutional research milieu typically involves a cast of characters that includes research leaders, research professionals and students. Indeed, in addition to producing new knowledge and understanding, academic research activities educate the highly qualified people who will become the next generation of research leaders and innovators. The industrial research scene is populated by the same people. Interaction between institutional and industrial researchers facilitates the transfer of ideas, technology and people. A healthy innovation system requires balance between institutional and industrial researcher capacity, as well as cooperation amongst them.

The development of knowledge into innovative technology and processes also requires the active participation of entrepreneurs. These are the people who transform research outcomes into innovations and bring those innovations to market. Just as discovery and invention require

the relentless application of expertise to research activities, so too do innovation and commercialization require specialist expertise and persistence.

Research infrastructure enables the people at the core of an R&D&I system to pursue the research activities that are precursors of discovery and innovation. Modern laboratories, research tools and office space are fundamental to the functioning of an R&D&I system.

In broad strokes, the expert academic and industrial researchers, entrepreneurial innovators, research and development activities, and research infrastructure are the components of an innovation system. It is possible to measure the performance of such systems using a variety of metrics. Compared to other provinces in Canada, NL's performance ranks near the bottom of the ladder. Canada itself does not compare particularly favorably to other rich countries and is well behind countries, such as Finland and Sweden, whose capacity to innovate has been recognized as world-beating. The evidence is available for those who wish to assess it.

The "knowledge" economy is very competitive. In most fields of science and engineering it is also international. Having described in broad terms the constituents of an R&D&I system, attention can now turn to describing attributes of a provincial system that will yield the desired outcomes under internationally competitive conditions.

To begin, it is important to recognize that the provincial R&D&I system has to grow significantly. This will require substantial public and business investments across the constituent parts. Investments in the human elements, research and development activities, and associated infrastructure have to be kept in balance over time, which will require foresight and planning. While there are certainly planning activities throughout the provincial scene, from government departments to institutions to

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businesses and business associations, these will inevitably reflect the relatively narrow interests and views of their sources. There is a role in this environment for an objective, independent, credible voice to help ensure that communal (provincial) public interests are being advanced. Some appropriately named and mandated council could serve this function, which would help secure public confidence that the R&D&I system meant to meet the challenges of prosperity is serving the public interest. The magnitude of the investment in a provincial innovation system demands a coherent plan. The plan warrants scrutiny if it is to be credible to the public.

Another characteristic of the provincial research scene is that it has been heavily dominated by institutional research. Indeed, as business investment in R&D has traditionally been modest, institutions might also be described as having taken a leadership role in establishing research roots in the province. Industry has followed suit and is positioned to expand its R&D&I presence significantly. In a high-functioning R&D&I system, research-based innovation drives business decisions. Entrepreneurial companies do and apply R&D to create economic wealth. New enterprises are created to pursue new market opportunities.

Necessity, as the saying goes, is the mother of invention. Identifying current needs and predicting future needs require insights informed by experience. Those insights can come from researchers, but so too can they come from business people, public servants, and others. This is important as it is the same needs and challenges that can provide the bases of an R&D agenda. An agenda dominated by researchers will likely yield outcomes that contribute to their target academic domains. These may subsequently be pushed beyond academic boundaries where they may or may not attract additional attention from other entities in the innovation ecosystem. An agenda informed and set by more diverse interests will be more likely to address market needs and societal challenges that have broader relevance.

If companies are to incorporate research-based innovation in their strategies, then they have to have a significant role in setting the R&D agenda, as well as an active role in actually transforming research outcomes into innovations. That is, there has to be a mechanism for enterprises to influence research directions and pull research outcomes, rather than simply wait for the outcomes that institutional researchers push out. This is a significant change in a jurisdiction like Newfoundland and Labrador, where, historically, most companies have been too small to sustain an internal R&D team. For companies that do pursue R&D&I agendas, funding programs with terms comparable to institutional programs need to be part of the landscape. It is worth pointing out that moving from a good idea to a market ready innovation requires R&D expertise and access to research equipment. It is also an expensive journey and one fraught with business risk.

Likewise, if government is to reap the full potential benefits of provincial R&D&I capacity, it will have to engage in the system not only as a source of financial support, but as a contributor to the R&D agenda by identifying knowledge gaps that need to be addressed in order to inform public policy decisions. There is considerable scope on the provincial scene for more integration of these elements of the R&D&I system.

Academic excellence is another desirable attribute of the provincial system. Research personnel, programs, and infrastructure have already been identified as system components. How can these be enhanced? In the near-term, it will be necessary to increase the number of research leaders in the province's research institutions. These people need to be supported by highly qualified research professionals who can effectively lever the researchers' capabilities. To ensure sustainable growth over time, investments are also needed to recruit new highly qualified personnel into R&D careers. Building and sustaining research groups in traditional academic settings is difficult due to institutional inertia and the nature of most research funding programs. In the current provincial context, this weakness can be addressed by expanding and enhancing research capacity in domain areas that have high relevance to those sectors most engaged in the R&D&I system. Further, recruitment of new

researchers should target those who are oriented to engagement beyond the walls of institutions. Likewise, R&D funding programs should provide incentives to new and existing institutional researchers to integrate their activities with others in the ecosystem. Indeed, provincial R&D funding incentives should seek to align the goals of researchers with the goals of the provincial innovation system. Otherwise, academic personnel will respond to the narrower incentives of the academic world, with the likely consequence of perpetuating the gap between institutional-based research and private (or public) enterprises and government policy-making. On the infrastructure front, the recent growth in research activity in the province's research institutions has resulted in physical capacity constraints. This is just the beginning. Alleviating these constraints in the near term will enable continued growth in successful areas. In the medium term, major infrastructure renewal will be required.

In discussing a provincial innovation system, the associated research agenda is probably fairly described as being at the "applied" end of the spectrum. This is not to argue that all research should be applied, or even necessarily relevant to local audiences, only that these are attributes of research that can be counted as part of a provincial innovation system. Similarly, by emphasizing the importance of wealth creation to the success of the system, it is reasonable to interpret the policy prescriptions as favorable to applied science and engineering. They are, but they are not intended to be exclusionary. Research in other fields can also contribute to the social and economic wealth of the province. Diversity enhances an ecosystem.

The opportunity to shape the province is in the hands of this generation. A vibrant research and development and innovation system is a necessary ingredient in a prosperous future. Realizing this vision is a shared responsibility that will require concerted efforts to plan and execute over the next several decades. The challenges of prosperity may very well be more difficult to meet than the challenges of hardship. Hardship is to be endured; prosperity demands that results be delivered. 

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