

**INNOVATION POLICY AND REGIONAL ECONOMIC DEVELOPMENT: AN
OVERVIEW OF THE CYBERSECURITY SECTOR IN NEW BRUNSWICK**

by

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ABSTRACT

Many jurisdictions globally are pursuing regional economic progress through innovation and entrepreneurship. The function of technological innovation as a major driver of economic growth has become widespread in developed economies. The term innovation policy is now generally used to describe policy that may have a role in supporting innovation. The utilization of such policies by various levels of governments in Canada to advance emerging sectors such as cybersecurity has generated considerable discourse among various stakeholders in academia, business, and government.

Cybersecurity is among the fastest growing technology-based sectors in the world. The global cybersecurity market size is forecasted to grow exponentially in the near future. New Brunswick was the first province in Canada to develop a comprehensive provincial cybersecurity strategy as part of its innovation policy.

This report reviews the provincial innovation policy and the growth of the cybersecurity sector in New Brunswick. Although regional economic development is a multifaceted topic, this report will be useful to policymakers in the evolving discussion on optimal use of innovation policy and programs by governments to promote economic development within a regional context.

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1.0 Introduction

Unlike science and research, innovation is not primarily about generation of new ideas, but rather to utilize such ideas for producing economic benefits by solving business problems, improving processes or enhancing competitiveness. The importance of innovation in creating sustainable competitive advantage and improving economic growth is now considered an important aspect for success in the knowledge economy.

On a policy level, the possibility of solving important social and economic issues through innovation is what makes it attractive to policymakers in the government spheres. It could be said that innovation is shaped by a variety of institutional routines and social conventions (Morgan, 2007). The innovation policy has now become a key tool for governments worldwide, in their attempt to drive economic growth and development (McCann and Ortega-Argilés, 2013). It can transform an economy in fundamental ways, such as moving away from dependence on natural resources or fossil fuel (Fagerberg, Martin and Laestadius, 2016).

The growing interest of researchers and policymakers in innovation policy has led to an increasing body of knowledge on the development and impact of innovation policy for economic performance (Edler and Fagerberg, 2017). It has also been suggested that it is desirable for development of a systemic approach to the analysis of policies shaping innovation (Weber and Truffer, 2017). Therefore, it is important that we study innovation

policy efforts to make them more effective for designing policies and implementing programs towards regional economic development.

Cybersecurity is about protecting networks, devices, and data from unauthorized access or criminal use and the practice of ensuring confidentiality, integrity, and availability of information (Source: United States Cybersecurity and Infrastructure Security Agency). Today, dealing with cyber threats is among the top priorities of every organization across the world. The global cybersecurity market is currently worth \$173B in 2020, growing to \$270B by 2026. By 2026, 77% of cybersecurity spending will be for externally managed cyber security services. Demand drivers include the ever expanding threat of cyber attacks, mounting exposure to cyber risk, increased risk awareness and increased regulation (Source: Australian Cyber Security Growth Network). In 2016, New Brunswick was the first province in Canada to develop a comprehensive provincial cybersecurity strategy as part of its innovation policy to facilitate economic growth in the province. Today, there is a significant presence of research institutes and cybersecurity firms in New Brunswick, especially in the provincial capital Fredericton.

This report focuses on public innovation policy where governments, often in consultation with other stakeholders, design and implement policy to support innovation in their jurisdiction. Although governments operate and formulate policy on multiple levels, such as municipal, regional, and national levels (Isaksen and Trippel, 2017), the main focus here is on the innovation policy at the provincial level and its impact on the growth of the New Brunswick cybersecurity sector in a regional context.

2.0 Innovation Policy

Innovation policy has been defined as the interface between research and technological development policy and industrial policy and aims to create a conducive framework for bringing ideas to market (Source: Parliament of the European Union). It is the means through which different levels of governments set priorities, formulate approaches, and provide support to innovation and economic growth in a jurisdiction. Innovation has become an increasingly important policy domain at the regional and national levels (Lundvall and Borrás, 2005).

More broadly, innovation policy comprises all combined actions that are undertaken by public organizations that influence innovation processes...Innovation policy thus includes actions by public organizations that unintentionally affect innovation (Borrás and Edquist, 2013). It plays an important role in relation to science and technology, and also more general implications for economic development and regeneration at both national and regional levels (Howells, 2005). More recently, broad based innovation policy has expanded upon the traditional Research and Development based approaches by further incorporating non-technological innovations as innovation policy metrics and outcomes (Viljamaa, Kolehmainen, and Kuusisto, 2009).

The definition and usage of innovation policy will evolve with our continued understanding of the innovation process and its contribution to economic prosperity. Nowadays, it includes multiple aspects of business and the economy such as knowledge management, intellectual property rights, design, and training (Niosi, 2018).

3.0 Regional Economic Development

Regional economic development is a combination of qualitative and quantitative features of a region's economy, which the qualitative or structural...The qualitative attributes include the types of jobs, not only their number, and long-term and structural characteristics, such as the ability to bring about new economic activity and the capacity to maximize the benefits which remains within the region (Malecki, 1991). It is a process in which local governments or community based organizations are engaged to stimulate or maintain business activity and/or employment (Blakely, 1994).

Regional economic development has also been defined as the application of economic processes and resources available to a region that results in the sustainable development of, and desired economic outcomes for a region and that meet the values and expectations of business, of residents and of visitors (Stimson, Stough, and Roberts, 2006). It is a set of sustained, concerted actions taken by policy makers to promote the economic well-being and the standard of living of certain communities or regions. These actions may involve investing in infrastructure, social well-being, human capital, business development, among other initiatives (Carvalho, Ed. 2016).

The global economy has gone through some structural changes in the last few decades. However, the economic development is disparate among nations, sub-national jurisdictions, and even at times areas within a metropolitan city. Some geographic areas thrive economically while others lag behind in job opportunities, investments, and wealth

creation. The regional economic disparity is a snapshot in time as high growth areas flourish and decline over time.

The role of regions in national economies has changed significantly in recent times as a result of globalization and structural adjustment (Stimson, Stough, and Roberts, 2006). However, it is seen that some regions have been successful in adapting to changes brought about by globalisation and advent of knowledge economy whereas other areas have been less successful in dealing with such challenges, leading to economies having booming and weaker regions, at times even within the same country.

Regional economic development could be seen as both a product and a process. It is the product of economic development that the residents of a region are mostly concerned with such as job opportunities, wealth, investment, standard of living and working conditions. Any increases or improvements in these measures are equated with economic development. On the other hand, it is also the process which generally concerns policymakers such as industry support, infrastructure, labour force and market development (Stimson, Stough, and Roberts, 2006).

Although, there has been rapid shifts in economic landscape due to technological, social, and political changes, there is a widespread agreement in academia that knowledge, learning and innovation are key to economic development and competitiveness for businesses, countries, and regions (Tödting and Trippl, 2005). Thus,

it is helpful for us to understand what role innovation policy plays in regional economic development, especially of weaker regions in a country.

There are various regional development agencies that operate in New Brunswick. A major player is the Atlantic Canada Opportunities Agency which is mandated by the federal government to create opportunities for economic growth in Atlantic Canada by helping businesses become more competitive, innovative and productive, by working with diverse communities to develop and diversify local economies, and by championing the strengths of Atlantic Canada (Source: Government of Canada). The Miramichi Regional Economic Development and Innovation Fund makes local investments in existing business and new business startups within the boundaries of the county of Northumberland and the northern portion of Kent County in New Brunswick (Source: Government of New Brunswick). Ignite Fredericton is a municipal economic development agency for the Greater Fredericton Area focused on business growth and attraction, population growth (student retention, immigration, repatriation), and various strategic initiatives to strengthen the entrepreneurial ecosystem (Source: City of Fredericton).

As we can see that regional economic development is promoted by all levels of governments in Canada. However, in this report we only look at the New Brunswick provincial innovation policy emphasis on development of the cybersecurity sector and its corresponding contribution to the province's regional economic development.

4.0 New Brunswick Innovation Agenda

The challenges of globalisation and structural changes in the provincial economy from a natural resource based and industrial setting towards knowledge economy was necessitated with the decline of sectors like forestry in New Brunswick. In 2001, the province released *Embracing Innovation: An Innovation Agenda for New Brunswick 2002-2012* outlining strategic goals to make it a leader in the knowledge-based economy with increased innovation capacity as major drivers of future economic growth.

The report stated that New Brunswick's future competitiveness will be determined by how well the province performs in three key areas:

- (1) improving the capacity for innovation;
- (2) increasing productivity; and
- (3) expanding export orientation.

Moreover, the report listed top ten action priorities of the Innovation Agenda:

1. Establishing an Innovation Foundation to help build the province's R&D and innovation capacity;
2. Improving New Brunswick's R&D Tax Credit system;
3. Establishing the Technology Adoption and Commercialization Program to enhance the ability of the private sector to adopt and commercialize new technologies that improve productivity, competitiveness and value-added production;

4. Establishing a Job Start Strategy that will support recruitment, retention and repatriation of young people and of seasoned and successful business persons and skilled researchers;
5. Providing a one-time investment of \$15 million through the creation of a special University Infrastructure Trust to assist in ensuring excellence in the research and teaching capacity of New Brunswick's universities;
6. Implementing the University-Related Research Parks Initiative to encourage the development of university-related research parks for the purpose of increasing provincial R&D capacity;
7. Undertake a comprehensive Strategic Clustering Initiative aimed at targeted innovation clusters, led by the private sector and involving industry, learning and research institutions, and communities;
8. Establishing the Enterprise Network of 15 community economic development agencies that will result in a strongly coordinated approach to economic development that involves all partners and stakeholders at the regional level;
9. Encouraging high-speed broadband Internet connectivity around the province and in our schools and community colleges as part of the New Brunswick "Learning Grid". This will ensure that all regions of the province can benefit from the developing new economy; and
10. Implementing the eNB.ca strategy based on action plans developed by the Premier's Roundtable on eNB and Innovation.

At the end of 10 year plan, the provincial government released a follow on report in April 2012 named *Strategies for Innovation: A framework for accelerating the Province of New Brunswick*. The report mentioned information and communications technology, biosciences, industrial fabrication, value- added wood, value-added food, and aerospace and defence as priority sectors for provincial economic development. The word ‘cybersecurity’ was not mentioned this innovation report.

The government also passed a legislation titled *New Brunswick Research and Innovation Council Act, SNB 2013, c 5* and formed a research and innovation council to boost innovation and research in the region. It subsequently made appointments to the New Brunswick Research and Innovation Council on 24 April 2013.

Furthermore, in April 2018, the government released *New Brunswick’s Innovation Agenda* to foster innovation and boost research and development, which will help grow the economy and create job opportunities for New Brunswickers (Source: Government of New Brunswick). This report stated that the province wanted to be a leader in the cybersecurity sector through investment in cybersecurity education, improve commercialization of cybersecurity research, support cybersecurity startups, and grow cybersecurity cluster in New Brunswick. It stated the aim to build scale and capacity to support business growth, workforce development and high value career opportunities in cybersecurity (Source: Government of New Brunswick). The word ‘cybersecurity’ was mentioned 27 times in this innovation agenda. Moreover, the government announced the

investment of C\$53.5 million in the new innovation agenda that was aimed to boost education, workforce, and research and development in the province.

5.0 New Brunswick Cybersecurity Initiative

The New Brunswick cybersecurity initiative was launched by the provincial government in 2016 with the launch of CyberNB¹, a strategic economic development initiative spearheaded by Opportunities NB², the economic development arm of the provincial government. The plan was described by the province as following:

The New Brunswick Economic Growth Plan for cybersecurity will involve consolidating New Brunswick's role as the Canadian epicentre for cybersecurity, and aligning our educational assets to support cross-sector development of adjacent opportunities.

CyberNB is a strategic economic development initiative spearheaded by Opportunities NB. Opportunities NB has developed its CyberNB Plan to realize this opportunity's potential. The plan encompasses the following five areas: research and post-secondary education; start-ups and new products; physical infrastructure; digital infrastructure; and workforce development.

¹ cybernb.ca

² onbcanada.ca

The strategy was developed with industry leaders, academia and government. It is a deliberate growth strategy aimed at creating high-value jobs and will have a positive impact on New Brunswick's GDP over the next five years. We have also identified actions under the five pillars of the New Brunswick Economic Growth Plan that will help us strengthen and grow the cybersecurity industry in the years ahead.

People – Strengthen the Workforce

- Develop and promote industry-specific curriculum for high school, university and college curriculums. CyberSmartNB represents the focused development of a cybersecurity educational pipeline to train new information security experts and accelerate workforce development.
- Amplify the presence of the existing industry in New Brunswick, and its prospective employment opportunities.

Innovation

- Link small-scale entrepreneurship to industry giants for knowledge and resource growth.
- CyberInnovateNB represents the establishment of a new incubator dedicated to start-ups and new tech development in cybersecurity.
- Use mobile technology, social media and other channels to amplify New Brunswick's reputation as a global leader in cybersecurity.

Capital – more private investment

- CyberSparkNB supports the creation and accelerated growth of cybersecurity technologies, industry cluster development and jobs in New Brunswick.
- CyberSecureNB is dedicated to securing New Brunswick’s digital services and infrastructure, while raising public and industry awareness of cybersecurity threats.

Investing in strategic infrastructure

- Constant maintenance of New Brunswick’s broadband connectivity.
- Continued development of CyberNB website as projects and initiatives unfold.

Foster agility and nimbleness in the public sector and across the economy

- Further collaboration with international partners.
- Work with industry to advance and develop new target markets.

Additionally, in August 2018, the provincial government in partnership with the federal government contributed nearly C\$1 million towards the construction of Cybersecurity Innovation Centre in Fredericton, NB. It further contributed C\$37-million for building of disaster resilient and high security buildings in Fredericton, NB that will house cybersecurity services working to protect critical infrastructure.

6.0 Discussion and Policy Implications

The underlying premise of using innovation policy is that it can lead to regional economic growth through which regions such as New Brunswick can achieve goals of a robust economy and an expanding tax base, which would enable a better quality of life outcomes for residents in terms of job opportunities and continued provisioning of high quality social services. On that notion, the emphasis on cybersecurity since 2016 in the innovation policy of the New Brunswick government seem to have enabled regional economic development by playing a part in the development of the cybersecurity sector in the province.

There have been some notable developments in areas of cybersecurity such as 2017 opening of the Canadian Institute for Cybersecurity in Fredericton, a collaboration between University of New Brunswick and IBM Corp. Other companies like TD Bank, Bell Canada, Siemens Canada, and McCain Foods subsequently joined as industry partners. The institute currently employs nearly 50 graduate students and researches in areas of cybersecurity and has recently launched a Master of Applied Cybersecurity to develop the talent pool in the region. The Cybersecurity-NRC Cybersecurity Collaboration Consortium was also established in 2019 as a partnership between Canadian Institute for Cybersecurity and National Research Council to focus on security the security of Internet of Things (IoT) devices (Source: Canadian Institute for Cybersecurity).

The startup ecosystem has also seen cybersecurity companies like Sentrant Security Inc. (acquired by Nielsen Holdings). Bulletproof Solutions, a GLI company based in Fredericton provides cybersecurity services. Beauceron Security, a cybersecurity software developer, raised a C\$0.5 million in seed funding in August 2018. Siemens Canada announced its plan to open Siemens Cybersecurity Centre in Fredericton that could create up to 60 jobs. In May 2018, Canadian Nuclear Laboratories opened a cyber security research facility named National Innovation Centre in Fredericton.

Although there are other factors that would have contributed to the aforementioned success, the developments in the cybersecurity sector in New Brunswick shows the role of provincial government's innovation policy as a major driver of economic growth through technological innovation. It also serves as an exercise in whether innovation policy can be leveraged by economically weaker regions in Canada to pursue their aims of economic prosperity. However, context matters in any analysis and it would be wise to assess and adapt the success of the innovation policy by also looking at the cost of implementing the programs that resulted in growth of the cybersecurity sector in the province. The long term sustainability of innovation policy should be given particular attention.

Regional innovation policymakers have to be particularly flexible in their approaches and ready to use trial and error method to problem solving (Cooke and Piccaluga, 2006). This report only reviewed the provincial innovation policy in relation to the cybersecurity sector, however the links between the three main levels – Fredericton

(municipal), New Brunswick (provincial), and Canada (federal) can be considered for a better understanding of the interplay of various innovation policy to a region's economic development.

Going forward, New Brunswick can continue to build on its strengths in the cybersecurity sector, with a strong university research system and a growing startup scene. An effective innovation policy is one that provides direction to innovation efforts by businesses and that is credible and not subject to frequent, unpredictable changes (Mazzucato and Semieniuk, 2017). Any policy can only reach its full potential with a commitment of continuity and flexibility from successive New Brunswick governments.

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