# Part 1: Measuring Innovation

## Introduction

Innovation is the cornerstone of modern economies, driving productivity, competitiveness, and prosperity. For Canada to thrive in an increasingly knowledge-based global market, it must enhance its capacity to innovate across all sectors. This strategy outlines a comprehensive plan to develop Canada's innovation ecosystem by leveraging its strengths and addressing its weaknesses.

## Key Factors Driving Innovation

We discovered five key factors that can drive the innovation from 2008 to 2020.

1. Skills – Human Capital

The "Skills" index reflects the education and expertise within a workforce. Higher skill levels contribute to a more innovative environment as a skilled workforce is essential for generating and implementing new ideas.

1. Information and Communication Technology (ICT)

The "ICT" category reveals that investment in technology infrastructure enhances connectivity and the capacity for innovation.

1. Research and Development (R&D)

The "Research and Development" index is critical as it reflects the investments made into discovering new information and technologies. Consistent R&D investment from both private and public sectors is crucial for sustaining innovation.

1. Industry Activity

The "Industry activity" index indicates the level of active engagement and innovation within industries. A higher index in this area suggests a competitive environment that stimulates innovation through collaboration and competition.

1. Access to Finance

The "Access to finance" index is vital for enabling innovative projects and ensuring companies can fund their development initiatives. Countries with easier access to capital for startups and innovation projects tend to demonstrate higher innovation outputs.

## Overall Innovation Exploration

We developed an overall insight into innovation.

In Figure 1, trends represent the global index for different categories. The overall index increased a little between 0.4 and 0.5 from 2008 to 2020, in which innovation in accessing finance occupies the main part. Innovation in Research and Development (R&D) and Information and Communication Technology (ICT) have increased the most, driving the overall global innovation to achieve a higher level.

For ICT, the data shows a significant upward trend until 2020, indicating the growing importance of technology in fostering innovation. For example, Generative AI models, especially the first ChatGPT model in the year 2018, have been introduced and more frequently applied in research and technology areas. Besides, the incremental growth from 0.202 in 2008 to 0.294 in 2021 shows a positive trend in R&D spending, which correlates with overall improvements in the innovation index.

Figure 2 shows the average index of innovations for each factor. The highest average is for Access to finance (0.6598), suggesting that financial resources significantly impact overall innovation levels, supporting the conclusion above. Factor Industry Activity closely follows at 0.5529, indicating the importance of active industrial participation in innovation processes. The overall index (0.4512) suggests that countries can improve their innovation performance through strategic investments in the factors mentioned. Factor R&D has the lowest average index with a value of less than 0.3, increasing a lot from 0.2 to 0.3 through the years.

Besides, we discovered the top 5 countries across various categories and presented them in Figure 3. The USA is the top 1 country with the highest overall innovation index. Besides, Korea has the highest innovation index in ICT, and China has the highest innovation index in R&D.

Countries with higher ICT indexes tend to show greater overall innovation, as evidenced by the data for top-performing countries. Besides, countries like Ireland and the Philippines displaying strong industry activity lead in innovation, as industries that prioritize innovation drive economic growth and demand for new technologies.

We also studied the floating index through the years in different countries. Focusing on Canada in Figure 4, the innovation in factor ICT has improved a lot from the year 2008 to 2020, with its index value increasing from approximately 0.6 to 0.9. This might be because of the new technology opportunities, like the development of Generative AI models such as ChatGPT.

Other factors all remain stable (although some of them experienced a small decrease). Over the years, Canada has shown a relatively stable skills index, indicating that the workforce maintains a level of competency that supports innovation. Besides, the stability of the factor Access to Finance index presents a foundation for potential innovators to secure funding.

Then, focusing on other countries. Considering both Figure 3 and 4, top countries like China, Hong Kong SAR, and the United States consistently show high overall indexes, driven by robust application of the identified factors—especially in ICT and R&D. Countries like Finland exhibit strong performances in all categories, particularly in skills and industry activity, suggesting that Canada's innovation ecosystem might benefit from enhancing these particular areas.

The factors driving innovation as derived from the data are largely centered around human capital, technological infrastructure, R&D investment, industry engagement, and financial accessibility. Prioritizing these areas can cultivate a robust innovation ecosystem, enabling countries to sustain and enhance their global competitiveness in an increasingly knowledge-based economy.

# Part 2: Strategy for Canada’s Innovation Ecosystem

## **Canada's Current Strengths**

1. **Strong Educational System and Skilled Workforce**
   * **High Levels of Education**: Renowned universities producing a robust pool of graduates, especially in STEM fields.
   * **Stable Skills Index**: A competent workforce capable of supporting innovative activities.
   * **Work-Integrated Learning Programs**: Initiatives connecting SMEs with skilled interns enhance innovation capacity.
2. **Advancements in Information and Communication Technology (ICT)**
   * **Improved ICT Innovation Index**: Significant increase from 2008 to 2020.
   * **Adoption of Emerging Technologies**: Growing emphasis on technologies like artificial intelligence.
   * **Access to Finance**: A relatively high index supports ICT development.

## **Canada's Current Weaknesses**

1. **Underinvestment in Research and Development (R&D)**
   * **Low R&D Index**: The lowest among key factors, indicating insufficient investment.
   * **Chronic Underinvestment**: From both public and private sectors.
2. **Cultural Barriers to Entrepreneurship**
   * **Risk-Averse Culture**: High fear of failure discourages innovative ventures.
   * **Challenges in Scaling Businesses**: Hinders growth and economic impact.
3. **Declining Industry Activity**
   * **Underdeveloped High-Tech Exports**: Affects global competitiveness.
   * **Declining Manufacturing Base**: Impacts industrial innovation.
4. **Challenges for SMEs**
   * **Talent Recruitment Issues**: Difficulty in attracting skilled workers.
   * **Financing Difficulties**: Limited access to capital for innovation.

## **Strategic Recommendations**

1. **Enhance Human Capital**
   * **Promote STEM Education**: Encourage participation from early education onward.
   * **Upskilling Programs**: Focus on future skills in technology sectors.
   * **Strengthen Industry-Academia Collaboration**: Expand co-op programs and internships.
2. **Increase Investment in R&D**
   * **Boost Funding**: Increase public and private R&D investments.
   * **Encourage Partnerships**: Foster collaboration between research institutions and industry.
   * **Support Commercialization**: Assist in bringing research to market.
3. **Strengthen ICT Infrastructure**
   * **Invest in Digital Infrastructure**: Expand high-speed internet access nationwide.
   * **Support Technology Adoption**: Provide incentives for SMEs to adopt emerging technologies.
4. **Stimulate Industry Activity**
   * **Develop Industry Clusters**: Promote collaboration among interconnected companies.
   * **Invest in Advanced Manufacturing**: Modernize manufacturing processes.
5. **Improve Access to Finance**
   * **Expand Venture Capital**: Provide incentives for funding startups.
   * **Enhance Financial Literacy**: Educate entrepreneurs on funding options.
6. **Address Cultural Barriers**
   * **Promote Entrepreneurial Mindset**: Celebrate innovation and normalize failure as learning.
   * **Reduce Fear of Failure**: Implement policies that mitigate risks for new businesses.
   * **Support New Business Creation**: Provide incentives and reduce entry barriers.

## **Conclusion**

By leveraging its educational strengths and addressing key weaknesses, Canada can enhance its innovation ecosystem. Implementing these strategic recommendations will drive economic growth, improve global competitiveness, and elevate the quality of life for all Canadians.

# Part 3: Practical Steps to Enhance Innovation in Canada

Building on the analysis of key factors driving innovation, it is evident that strategic investments in human capital, technological infrastructure, and global collaboration are essential for fostering a robust innovation ecosystem. To address these needs, we propose two main areas of focus: expanding internship programs and strengthening international collaborations, including engaging Canadians abroad.

## Expanding Internship Programs

Internship programs serve as a bridge between academic research and industry application, ensuring a steady flow of skilled individuals into the workforce. In Canada, programs such as Mitacs have already demonstrated success by linking graduate students with industries. However, these programs can be expanded to maximize their impact. First, increasing funding for Mitacs and similar initiatives would allow more students to participate, particularly those from underrepresented fields such as clean energy, quantum computing, and artificial intelligence. These areas are crucial for Canada's future competitiveness in global innovation.

Additionally, internship programs should be tailored to provide interdisciplinary experiences that combine technical skills with entrepreneurship training. For example, students could receive mentorship from both industry leaders and academic researchers, fostering a culture of practical innovation. The inclusion of international students in these programs should also be prioritized, as this would expose Canadian researchers to diverse perspectives while positioning Canada as a global hub for research talent.

## Strengthening International Collaborations

International collaborations play a critical role in driving innovation by pooling resources, knowledge, and expertise across borders. Canada can enhance its innovation ecosystem by forging stronger partnerships with leading innovation hubs worldwide. For instance, collaborating with European research consortia such as Horizon Europe or Asian technology centers like Japan and South Korea would enable knowledge exchange in cutting-edge fields such as AI and renewable energy.

Moreover, Canada should actively participate in multinational research projects by co-funding initiatives with organizations like the World Bank or United Nations. These collaborations would not only amplify Canada’s influence in global innovation networks but also provide Canadian researchers with access to advanced facilities and expertise unavailable domestically.

## Engaging Canadians Abroad

Canada's innovation strategy should also focus on leveraging the expertise of Canadians working or studying abroad. These individuals represent a wealth of knowledge and connections that can be tapped into through targeted initiatives. Programs like a "Canadian Innovation Network" could be established to connect expatriates with domestic industries, offering them opportunities to contribute to projects in Canada remotely or through temporary placements.

For example, Canadian researchers working in Silicon Valley or European R&D institutions could mentor startups in Canada or collaborate with local researchers on joint projects. Incentives such as tax benefits or research grants could be offered to Canadians abroad who participate in these initiatives, ensuring their sustained engagement.

## Expected Outcomes

By expanding internship programs and strengthening international collaborations, Canada can address critical gaps in its innovation ecosystem. These efforts would enhance the skillsets of the Canadian workforce, foster the exchange of ideas, and position Canada as a leader in global innovation. Additionally, leveraging the expertise of Canadians abroad would ensure that Canada remains connected to the latest advancements and trends in international research.

In conclusion, focusing on internship programs and international collaborations aligns with the key factors driving innovation, as identified in our analysis. By prioritizing these strategies, Canada can build a sustainable and inclusive innovation ecosystem that supports long-term economic growth and global competitiveness.

# Appendix

A graph of different colored lines

Description automatically generated

A graph of blue bars

Description automatically generated

A graph of different bars

Description automatically generated with medium confidence

A graph of different colored lines

Description automatically generated