Enhance Canada Innovation Ecosystem

Sector Specific Strategies for Global Completeness

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MIE1624 Group 10

Course Presentation

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Introduction

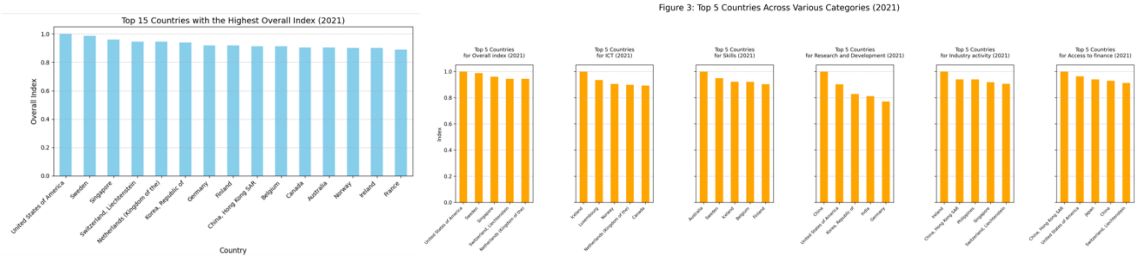
Canada's global innovation standing has faced significant challenges in recent years, as highlighted by its declining rankings in the Global Innovation Index and other international benchmarks. While Canada demonstrates strengths in areas like access to finance and workforce skills development, it lags behind global leaders in critical sectors such as research and development (R&D), information and communication technology (ICT) adoption, and digital innovation. This proposal examines Canada's innovation ecosystem, compares it with global leaders such as the United States and Sweden, and identifies key sectors driving Canada's innovation improvement. By analyzing Canada's performance across key sectors and using the insights from global best practices, this report aims to provide actionable recommendations to enhance Canada's innovation capacity by designing sector-specific programs as strategies, foster economic growth, and improve Canada's global competitiveness.

Canada's Current Global Standing in Innovation

1. Analysis of Global Innovation Index (2008 - 2021)

The Global Innovation Index (GII) from 2008 to 2021 gives a clear picture of how countries perform in innovation and shows Canada's position globally. The dataset tracks how innovation has changed over the years and highlights the strengths and weaknesses of different countries.

It focuses on six key areas: the Overall Index, which sums up a country's overall innovation ability; ICT, which looks at technology infrastructure and use; Skills, which measures the quality of the workforce; Research and Development, which assesses R&D activity; Industry Activity, which looks at how industries perform; and Access to Finance, which shows how easily funding is available for innovation. These features help to understand Canada's innovation performance compared to other countries.



Top 15 countries with the highest overall GII index (2022) & Top 5 countries for each GII index

The **top three countries in the 2021 Global Innovation Index are the US, Sweden, and Singapore**, while **Canada ranks 11th** among the top 15. Canada is 5th in ICT but does not place in the top 5 for other features.

According to the 2024 Innovation Report Card by the Conference Board of Canada, Benchmarking Canada's Innovation Performance, Canada has lost its way regarding innovation, ranking 15th among 20 countries.

By applying the KNN algorithm to the GII dataset, we conclude the country that shares the most similarities to Canada in innovation progress is **Finland, following by United Arab Emirates, Austria**. South Africa, and Israel.

1. Compare Canada with US, Sweden, and Singapore on GII

Change of each GII index for US, Sweden, Singapore and Canada (2008-2021)

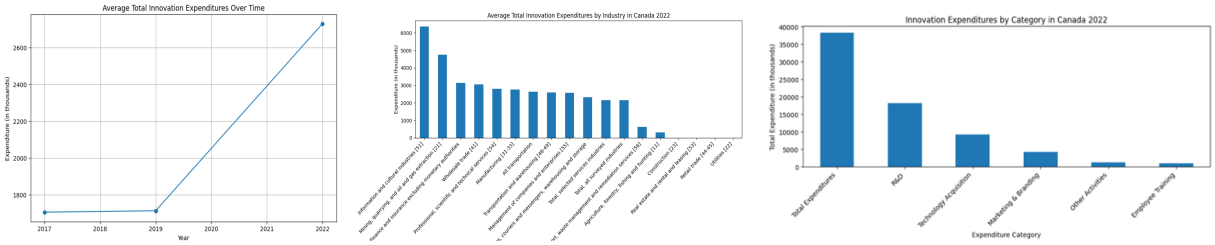
GII in each category for US, Sweden, Singapore and Canada in 2021

Canada's performance in innovation compared to the US, Sweden, and Singapore reveals both strengths and areas for improvement. While Canada shows stable but moderate performance in research and development (R&D), it lags behind global leaders in terms of investment, innovation funding, and patent activity. Addressing these gaps will require increased funding, stronger collaboration between universities, industries, and government, as well as incentives to drive private sector innovation. ICT remains a significant weak point, with Canada falling behind in digital infrastructure and technology adoption. To close this gap, efforts should focus on enhancing digital networks, supporting tech startups, and fostering innovation ecosystems.

On the other hand, Canada performs well in access to finance and excels in skills development, supported by a strong education system and workforce training. These strengths provide a solid foundation to further improve ICT and R&D performance by expanding financial tools for startups, increasing venture capital networks, and driving business innovation.

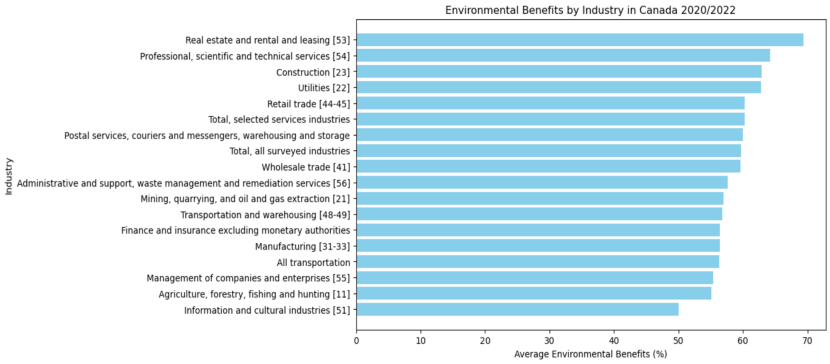
Canada's Innovation Policies and Key Sectors

1. Canada's Expenditures by Sector and Type in 2022



Canada's average total innovation expenditure (2017–2022)
Canada's average total innovation by Sector in 2022 & Canada's average total innovation by type in 2022

2. Canada's Environmental benefits from Innovation Activities by Sector



Canada's Environmental Benefits from New Product or Process Innovations by Sector 2020/2022

Canada's average total innovation expenditure has seen significant growth since 2019, with a sharp increase observed by 2022. In 2022, the largest investments were directed toward Information and Cultural Industries (ICT), Mining, Quarrying, Oil and Gas Generation, and Finance and Insurance (excluding monetary authorities). The most common category of innovation expenditure is Research and Development (R&D), followed by Technology Acquisition and Marketing and Branding.

Regarding environmental benefits, the top three industries with sustainability-driven innovations are Real Estate and Rental Leasing, Professional, Scientific, and Technical Services, and Construction. These industries demonstrate a strong focus on creating environmentally beneficial products or processes that are new to their respective markets.

3. Identify Canada's Key Sectors for Innovation Improvement

To enhance innovation and foster ecosystem growth, Canada should focus on industries with economic impact and potential for societal and environmental benefits. Based on global innovation progress, current policies, and industry-specific environmental benefits, three key sectors have been identified:

- **Professional, Scientific and Technical Services**: Innovation-driven, significant R&D expenditure ($1,488.75M in 2022), high environmental benefits (64.200), and potential for improvement in R&D capabilities (GII 2021 score: 0.6934).

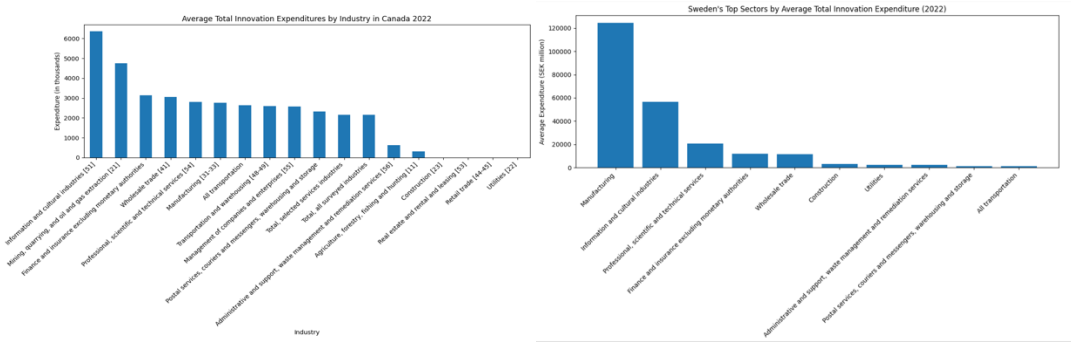
- **Information and Cultural Industries**: Strong ICT performance (GII 2021 score: 0.8929, top 5 globally), substantial expenditures ($2,105.25M in 2022), and opportunities to align digital innovation with sustainability (environmental score: 50.050).

- **Manufacturing**: Economic cornerstone ($1,459.25M in 2022), moderate environmental benefits (56.400), and potential to modernize through green manufacturing and innovation (lower GII "Industry activity" ranking).

Comparison of Canada to US and Sweden Across Key Sectors

Earlier in the analysis of the GII, we found that the top two countries are US and Sweden. We also determine Canada's key sectors driving innovation activities. Next, we will explore the innovation activities in these two countries' key sectors to identify Canada's potential strengths and weaknesses.

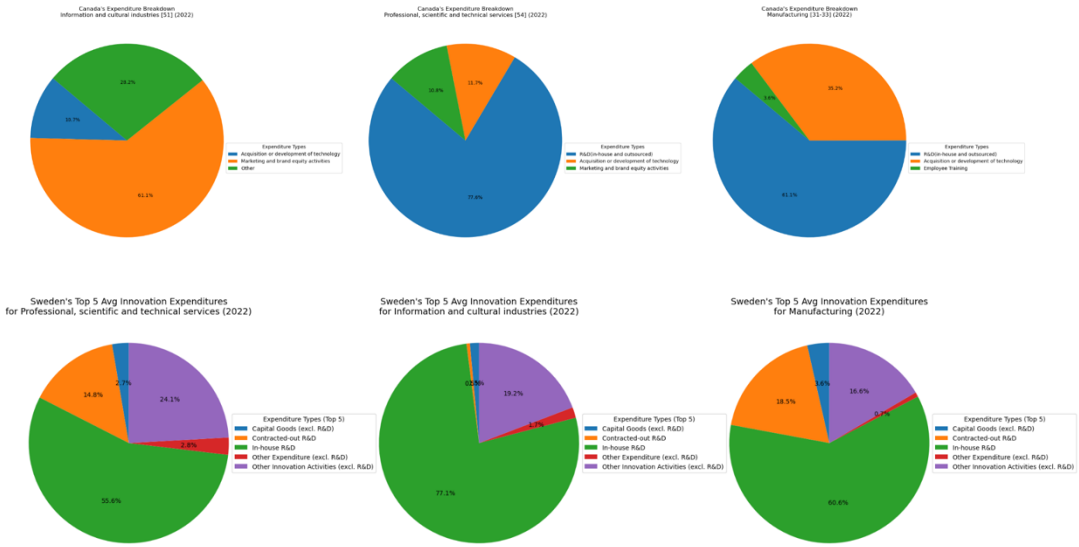
1. Canada vs. Sweden



Canada and Sweden's Expenditure by Industry 2022

A comparison of 2022 innovation expenditures between Sweden and Canada reveals similar sectoral focuses on innovation activities, with "Information and Cultural Industries" ranking high for both (1st for Canada, 2nd for Sweden).

However, Sweden prioritizes Manufacturing as its top focus, while it ranks 6th for Canada. "Professional, Scientific, and Technical Services" is Sweden's 3rd focus but Canada's 5th. Conversely, Canada emphasizes innovation in Mining, Quarrying, and Oil and Gas Extraction, a sector of lesser importance for Sweden's innovation efforts.



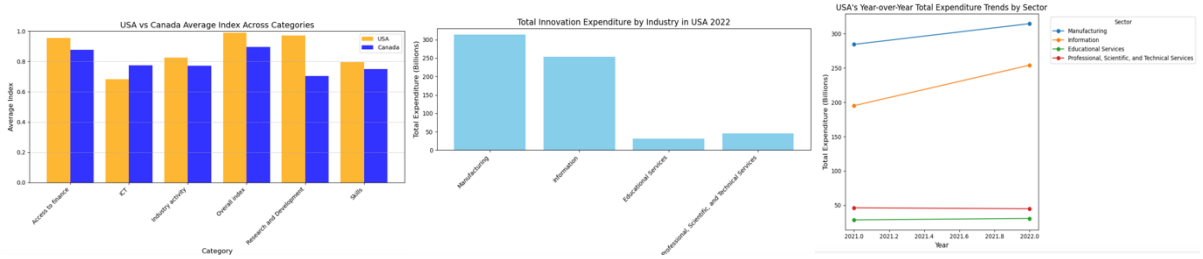
Canada and Sweden's Innovation Expenditure Breakdown for Three Key Sectors 2022

In 2022, Canada's innovation expenditures across the three key sectors were primarily directed toward R&D, followed by acquisitions, with minimal investment in employee training and marketing and branding activities. R&D accounted for 61.1% in information and cultural industries, 77.6% in professional, scientific, and technical services, and 61.1% in manufacturing.

Sweden also emphasized R&D in 2022, with a significantly higher proportion compared to Canada, reflecting its strong commitment to research-driven innovation. Over 70% of innovation spending in professional, scientific, and technical services, 78% in information and cultural industries, and 79% in manufacturing was allocated to R&D. Additionally, Sweden demonstrated a more diversified and targeted approach to R&D investment for innovation.

In Canada, while R&D leads overall innovation spending, technology acquisition is the second priority, with minimal focus on marketing, branding, and employee training. Increasing targeted investments in R&D and addressing the lack of funding for employee training could strengthen long-term skill development and innovation capacity.

2. Canada vs. US



Manufacturing

Capital Expenditures for Structures and Equipment for Companies with Employees: 2022 and 2021 Revised (Billions of current dollars)

Capital expenditures	2022	2021	% Change	
Total Manufacturing	**314.3**	**284.2**	**10.6%**	
Structures	76.5	68.6	**11.5%**	
Equipment	237.8	215.5	**10.3%**	
Durable Goods Industries	**179.1**	**155.3**	**15.3%**	
Structures	39.7	32.9	**20.9%**	
Equipment	139.3	122.5	**13.8%**	
Nondurable Goods Industries	**135.2**	**128.8**	**5.0%**	
Structures	36.8	35.8	**2.9%**	NS
Equipment	98.4	93.1	**5.8%**	

Source: U.S. Census Bureau, 2022 Annual Capital Expenditures Survey

Professional, Scientific, and Technical Services

Capital Expenditures for Structures and Equipment for Companies with Employees: 2022 and 2021 Revised (Billions of current dollars)

Capital expenditures	2022	2021	% Change	
Total Professional, Scientific, and Technical Services	**45.0**	**46.4**	**-3.0%**	**NS**
Structures	10.8	10.9	-1.1%	NS
Equipment	34.2	35.5	-3.6%	NS

Source: U.S. Census Bureau, 2022 Annual Capital Expenditures Survey

Information

Capital Expenditures for Structures and Equipment for Companies with Employees: 2022 and 2021 Revised (Billions of current dollars)

Capital expenditures	2022	2021	% Change
Total Information	253.9	195.0	**30.2%**
Structures	75.0	53.3	**40.8%**
Equipment	178.9	141.7	**26.2%**

Source: U.S. Census Bureau, 2022 Annual Capital Expenditures Survey

Comparison of US and Canada's Innovation Expenditure and GII Index (2022) & US Innovation Expenditure for the Three Key Sectors in 2022

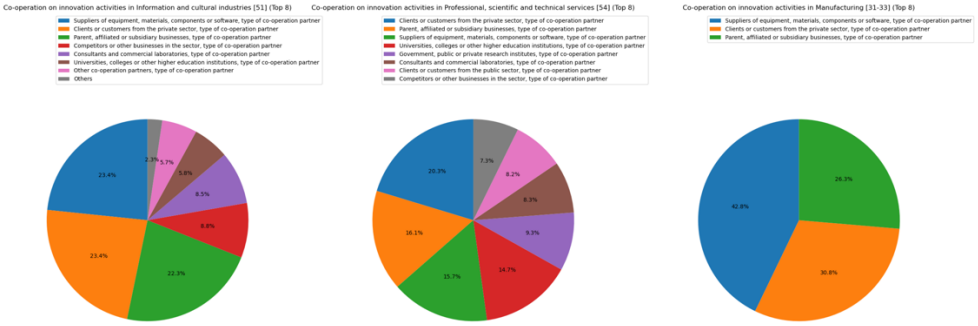
The **US outperforms Canada in all innovation categories, particularly in access to finance, R&D,** and overall index, while **Canada lags significantly in ICT and skills**. In 2022, US the information sector experienced robust growth, with a 30.2% increase in capital expenditures, driven by investments in structures and equipment. The manufacturing sector also showed a 10.6% rise in spending, particularly in durable goods industries.

To improve its innovation performance, **Canada can prioritize investment in ICT and workforce skills, expand R&D funding, and support high-growth sectors like information and manufacturing**. Strengthening collaboration between government, academia, and industry can further enhance innovation capacity and competitiveness.

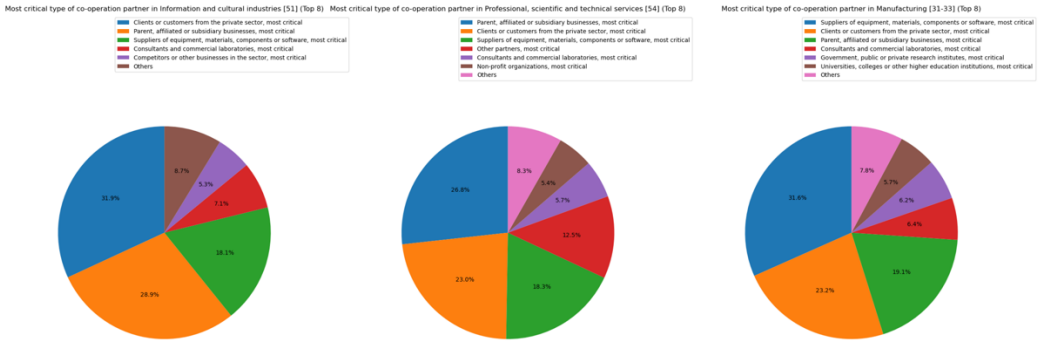
Main drivers for Canada's Innovation in Key Sectors

In this section, we further explored some critical drivers of innovation activities in Canada's key sectors by analyzing the following: Canada's co-operation on innovation activities (2020/2022), the most critical types of co-operation partners for key sectors (2020/2022), and the most critical government programs for key sectors (2020/2022)

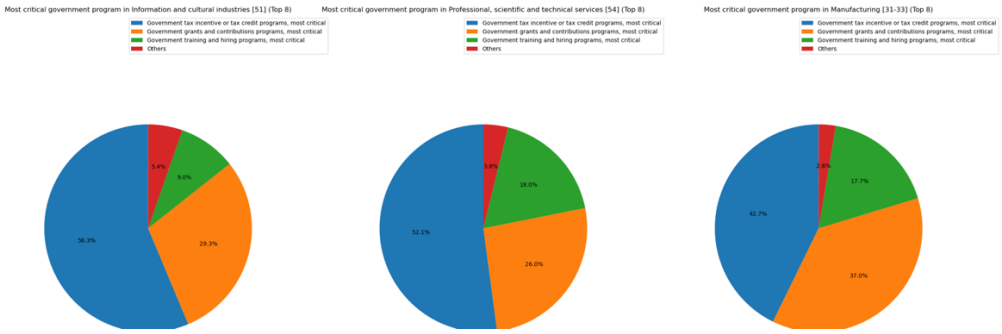
1. Canada's Co-operation on Innovation Activities for Key Sectors 2020/2022



2. Canada's Most critical type of co-operation partner for key sectors 2020/2022



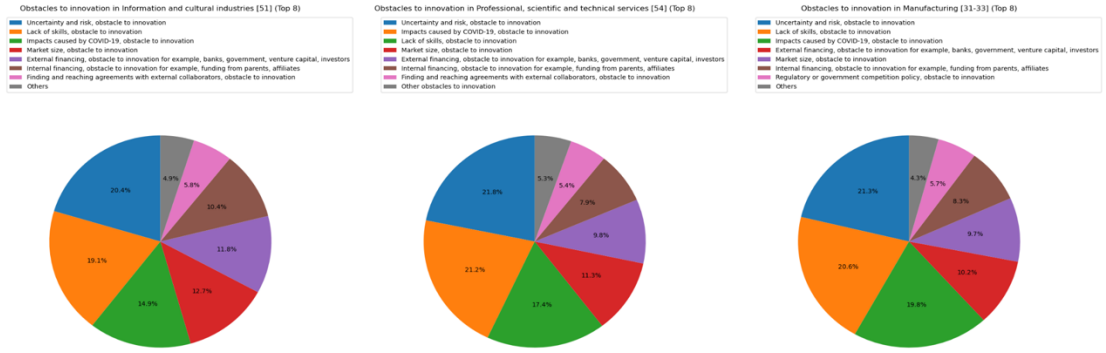
3. Canada's most critical government program for key sectors 2020/2022



Between 2020 and 2022, Canada's innovation in key sectors demonstrated both strengths and gaps. The first two sectors, **information and cultural industries and professional services, showed more balanced co-operation** with suppliers, clients, parent companies, and other partners such as government, consultants, and competitors. In contrast, **manufacturing heavily relied on suppliers, clients, and parent companies**, with limited engagement from other partners.

Critical innovation partners across all three sectors were primarily parent companies, clients, and suppliers, indicating a preference for internal and close-network collaboration. Government programs in all sectors were largely dominated by tax incentives and grants, with limited diversification in support mechanisms.

4. Obstacles in Canada's Innovation Strategy 2020/2022



In the **information and cultural industries**, key barriers to innovation include **uncertainty and risk (20.4%), lack of skills (19.1%), and impacts from COVID-19 (14.9%).** Market Size (12.7%) also pose significant obstacles. Addressing these challenges requires targeted workforce development programs and improved access to financial support.

For **professional, scientific, and technical services, top barriers are uncertainty and risk (21.8%), lack of skills (21.2%), market size limitations (17.4%), and external financing issues (11.3%).** Solutions include programs to enhance skills, funding mechanisms to mitigate risk, and efforts to expand market opportunities.

Similarly, **in manufacturing, the main obstacles are uncertainty and risk (21.3%), lack of skills (20.6%), COVID-19 impacts (19.8%), and market size constraints (10.2%).** Investments in workforce training, strengthening supply chains, and supporting market expansion can address these issues.

5. Summary of Canada's Strengths and Weaknesses in Innovation

Canada's overall strengths lie in its access to finance and skills development, supported by a strong education system and financial ecosystem. The information sector demonstrates robust growth in capital expenditures, and R&D remains a focal point for innovation spending.

However, Canada faces notable weaknesses, including lagging ICT adoption, lower R&D intensity compared to global leaders like the USA and Sweden, and insufficient collaboration with academic and consulting partners. Minimal investment in employee training and limited government support in key areas further hinder its innovation potential.

In **information and cultural industries**, strengths include balanced co-operation with suppliers, clients, and parent companies, alongside strong tax incentives and infrastructure investment. Weaknesses include limited partnerships with academia and consultants, as well as lack of government support mechanisms other than tax incentives and grant. In **professional, scientific, and technical services**, Canada benefits from strong ties with clients and parent companies and steady capital expenditure backed by tax incentives and grants. Yet, it struggles with lack academic partnerships, skill shortages, and market size limitations.

The **manufacturing sector** shows strengths in supplier reliance. Weaknesses include limited academic and consulting involvement, inadequate government support, and persistent skill gaps.

To strengthen its innovation ecosystem, Canada should focus on diversifying partnerships, increasing R&D investment, fostering academic-industry collaboration, expanding grants and training programs, and addressing ICT adoption and workforce development across sectors.

Recommendations on Building Canada's Innovation Ecosystem

We aim to enhance Canada's innovation ecosystem by providing sector-focused recommendations and program design strategies.

Professional, Scientific, and Technical Services: Government-Academic-Industry Research Consortium (GAIRC)

This program would create structured collaborations between government, universities, and industry to enhance R&D outcomes and technology transfer. The government could provide grants to support applied research in fields like AI, biotechnology, and sustainability while introducing internship programs to integrate graduate students and early-career researchers into real-world industry-academic partnerships. Targeted tax incentives for high-risk, long-term R&D projects in collaboration with academic institutions would encourage private-sector participation. Additionally, specific funding for innovation in defense technology could further enhance the sector's contributions. These measures aim to strengthen Canada's R&D ecosystem, increase innovation outputs, and address gaps in university and government co-operation.

Information and Cultural Industries: Digital Innovation and Sustainability Accelerator (DISA)

DISA would leverage Canada's ICT leadership while promoting sustainable practices in digital industries. Funding co-development projects between universities and digital creators in areas like AI, VR, and sustainable technologies could foster collaboration and innovation. Facilitating partnerships with international ICT leaders and engaging Canadian professionals working abroad to mentor startups would enhance knowledge transfer and market opportunities. To support sustainability, tax incentives for companies integrating green practices into digital technology production could be introduced. These initiatives would enhance Canada's global ICT standing, foster sustainable practices, and expand international market reach.

Manufacturing: Advanced Green Manufacturing Initiative (AGMI)

AGMI would modernize manufacturing by promoting eco-friendly technologies and advanced production methods. The government could introduce grants for clean energy and circular economy practices while encouraging partnerships with multinational companies to facilitate technology transfer to Canadian firms. Workforce skill development could be supported through technical apprenticeships and training programs focused on advanced technologies like robotics and IoT. Collaborating with international organizations such as the World Bank and UNIDO to secure funding for sustainability-focused projects could further strengthen this initiative. These measures would improve environmental sustainability, enhance competitiveness, and position Canada as a global leader in green manufacturing innovation.

Conclusion

Canada has the potential to reclaim its position as a global innovation leader by addressing key weaknesses and leveraging its existing strengths. To achieve this, strategic investments in R&D, ICT, and workforce skills are essential, alongside fostering collaboration between government, academia, and industry. This proposal focuses on three key sectors—Professional, Scientific, and Technical Services, Information and Cultural Industries, and Manufacturing—as drivers of innovation and economic growth. To address the challenges in these sectors, we recommend targeted programs. Professional, Scientific, and Technical Services: The Government-Academic-Industry Research Consortium (GAIRC) can strengthen partnerships, improve research outcomes, and foster advanced technologies like AI and biotechnology. Information and Cultural Industries: The Digital Innovation and Sustainability Accelerator (DISA) can promote digital innovation and sustainable practices by funding tech projects and fostering international collaboration. Manufacturing: The Advanced Green Manufacturing Initiative (AGMI) can modernize production with eco-friendly technologies, clean energy practices, and workforce training in advanced manufacturing. By focusing on these sectors, Canada can overcome its weaknesses, boost innovation, and improve its global standing. With a strong, collaborative approach, Canada can lead in sustainable, digital, and advanced manufacturing innovation.

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