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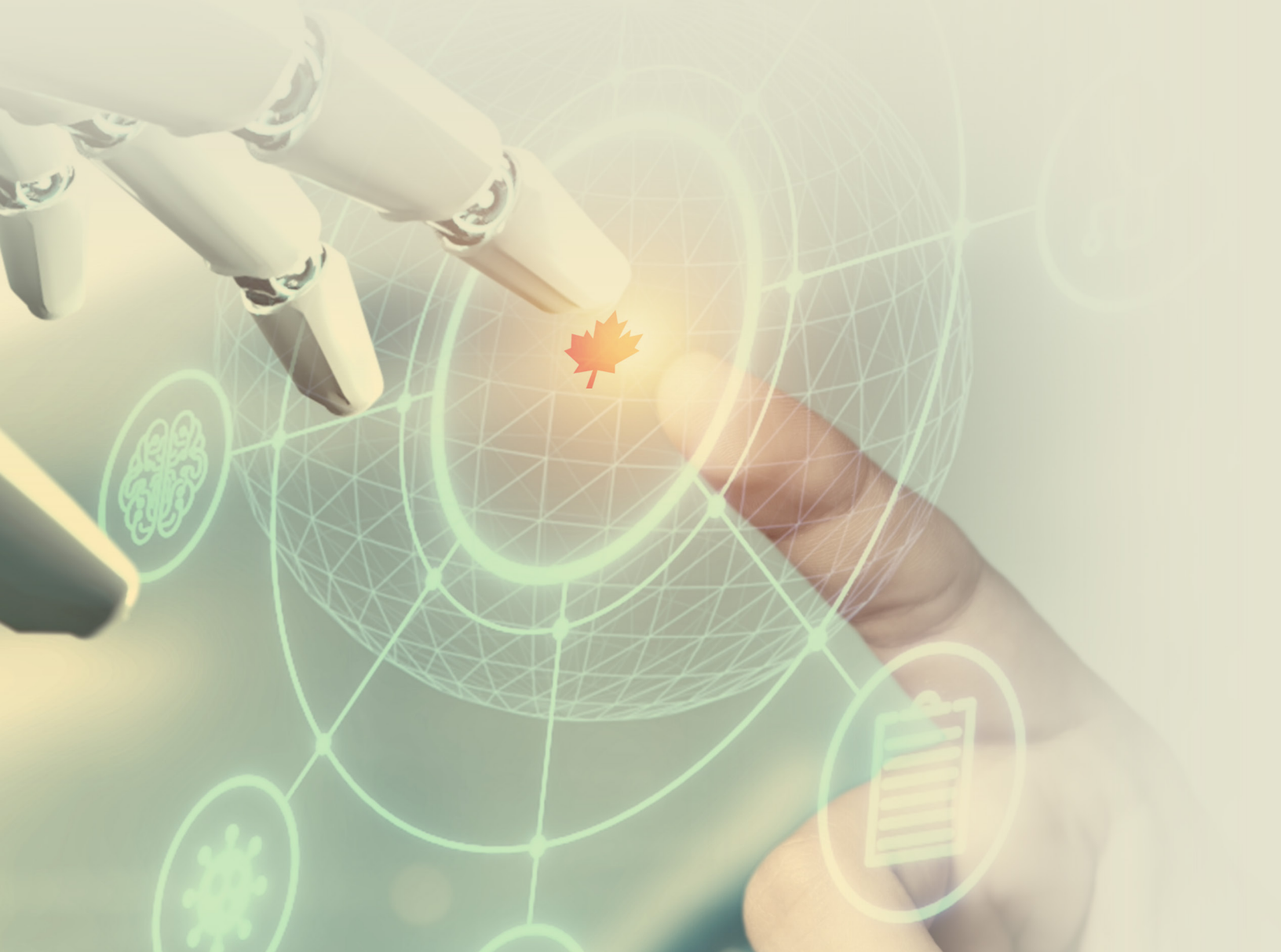
The CANADA AI Framework: A Blueprint for Global Leadership

Hossein Rahnama



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About the Author

Hossein Rahnama is the Rogers Research Chair in Artificial Intelligence and Human Creativity at Toronto Metropolitan University and a visiting professor at the Massachusetts Institute of Technology (MIT) Media Lab, where he also leads the sAIpien program. He is also the founder and CEO of Flybits, an artificial intelligence (AI) and data science company specializing in complex data-driven solutions for large enterprises. His research expertise lies in the design of human-AI systems, data governance, human-computer interaction and the development of mission-critical AI systems. A prolific author and inventor, he has published numerous papers and holds many patents in computer and data science. He has been recognized with numerous accolades, including being named to *MIT Technology Review*'s Global TR35 list (2012), *Smithsonian Magazine*'s Innovators to Watch (2013) and Canada's Top 40 Under 40 (2017), along with the Isadore Sharp Outstanding Graduate Award (2013). Hossein currently serves on the board of Havergal College. His past service includes roles as a council and board member at the Natural Sciences and Engineering Research Council of Canada, Canadian Science Publishing and Home Capital Group. He is also a member of the Institute of Corporate Directors, holding an ICD.D designation.

Executive Summary

Canada's global leadership in artificial intelligence (AI) is about to face a reckoning. Nearly 10 years after the establishment of Canada's national AI strategy, the country's research leadership in the field has yet to translate into sustained social or economic impact. The dynamism of its major AI institutes is waning; venture capital (VC) is increasingly hesitant; and organization-level AI uptake remains significantly below that of peer nations. While Canada continues to excel at training elite AI talent, it struggles to retain them — while the skills of those it does retain are often underutilized.

The underlying issue is a lack of alignment between Canada's AI efforts and its real economic drivers. Policy and funding have favoured large-scale, discovery-focused initiatives over targeted applications for industry verticals. The result is an ecosystem rich in promise but poor in productivity gains, sector-specific impact and intellectual property (IP) retention.

Canada must now pivot from a narrow focus on academic excellence and centralized funding to a broad-based strategy that emphasizes talent retention, industrial adoption, AI literacy and especially trust and transparency. This paper proposes a six-pillar strategy, under the acronym of the "CANADA" AI framework (consisting of collaboration and community; advanced algorithmic models; nurturing talent; application and adoption; data governance and ethics; and AI for all), as a practical road map for converting Canada's AI potential into national prosperity and global leadership. Amid Canada's current search for high-priority, nation-building initiatives, the CANADA AI framework offers a ready-made prescription for change that would represent a great leap forward for productivity and competitiveness across all sectors of the country's economy.

Introduction: The Trilemma of the Digital Age

The defining narrative of our time is the interplay of three powerful forces: data, AI and transparency. Data is the essential resource of the twenty-first century (*The Economist* 2017). AI is the engine of transformation that runs on that resource. And transparency, or trust, is the critical lubricant for the entire ecosystem (Omrani et al. 2022). Without trust, citizens hesitate to share data, consumers refuse to adopt AI services and the immense potential of the digital economy founders on a reef of public skepticism and fear.

Canada, committed to both technological advancement and democratic principles, faces a trilemma. How can we establish a resource-rich data environment, foster the rapid innovation needed to compete globally, and maintain public trust by upholding the rights and privacy of our citizens? This paper argues that these are not competing goals but a reinforcing loop. By prioritizing transparency and trust, Canada can unlock a new trajectory of sustainable and equitable growth. This playbook outlines a formula for national and international leadership, under the acronym of the CANADA AI Framework, using our own experience as a critical case study of both the trilemma's challenges and its immense, untapped opportunities.

The Canadian AI Paradox: A Critical Diagnosis

Before prescribing a solution, there must first be an honest diagnosis. Canada's experience with AI has been a paradox of world-class talent and research coexisting with underwhelming economic impact and strategic drift.

Research Leadership, Economic Lag

For more than 15 years, Canada has been a global hub for AI research, contributing foundational scientific discoveries through initiatives such as the Pan-Canadian Artificial Intelligence Strategy.[1] Yet this academic leadership has not translated into a meaningful role in the global AI economy, with Canadian firms lagging significantly in AI adoption and productivity gains compared to their international peers (Hemmadi 2025). Recent analysis shows firm-level AI adoption in Canada is less than half of that in the United States across almost every sector (Zhang and Castro 2025).

This phenomenon is exacerbated by what can be described as a leaky talent bucket. Canada excels at attracting and training elite postgraduate AI talent — much of it composed of international students and first-generation immigrants, who represent nearly three-quarters of graduates in key technical fields (Jean 2025). But these graduates' two most common career pathways lead to unrealized potential:

- **The comfortable path:** Talent is absorbed into established, less entrepreneurial Canadian sectors such as finance, banking and telecommunications, where deep-tech skills are often underutilized.
- **The exit path:** Talent is aggressively recruited by US-based big tech or bold start-ups, draining the domestic ecosystem of its most valuable asset. Some of these companies, while operating in Canada as subsidiaries, are not Canadian. As a result, Canada will not own the IP they develop (Gauthier and Herman 2025).

This failure to either realize or retain talent highlights the country's inability to broaden its niche postgraduate excellence into unique, at-scale educational programs that can supply a thriving national ecosystem beyond a few key research nodes.

From Stagnation to Chilling Effect

The pattern of underwhelming commercialization that plagues Canada's ecosystem ultimately has its roots in the policy and funding arrangements that define its parameters. The initial dynamism of AI centres of excellence such as Vector and Mila is showing signs of stagnation; since 2017, Canada has dropped from third to fourteenth place in Stanford University's Global AI Power Rankings (Stanford Institute for Human-Centered Artificial Intelligence Staff 2024). Canadian research is becoming comparable to that of other OECD nations rather than defining the frontier, with researchers struggling to innovate beyond the paradigms of their renowned founders, whose view of AI technology is now tinged with pessimism and whose focus has turned to global policy advocacy over IP commercialization and direct local economic impact. Just seven percent of the patents generated by Vector and Mila are held by the Canadian private sector; up to three-quarters of those patents have already left the country (Karadeglija 2024).

Meanwhile, the rising imperative for AI-driven innovation has tilted the ecosystem in favour of the private sector, where Canada's efforts have been chilled by a combination of unrealized acquisitions and public collapses, as seen in the following examples:

- After TD Bank acquired the AI start-up Layer 6, with the stated goal of transforming its business, the core founders departed just 16 months later to launch a new VC fund, signalling a shift from the acquisition's original revolutionary promise (Simpson 2019).
- The substantial, well-intended funding of Element AI by entities such as Caisse de dépôt et placement du Québec, the Quebec government and the Business Development Bank of Canada ultimately failed to save a company struggling with its business model (Silcoff and McNish 2020). Element AI was eventually sold to an American firm, primarily to acquire its talent pool, for less than the capital it had raised.

Element AI's collapse and sale at a fraction of its former valuation created a chilling effect on the VC community and exposed critical problems within Canada's innovation pipeline (Silcoff 2020; Mann 2020). The government's current engagement with other large language model (LLM) providers, which

1 See https://ised-isde.canada.ca/site/ai-strategy/en.

promote enhanced security and privacy features akin to their larger US counterparts, is beginning to echo the errors seen with Element AI, particularly after recent federal investment announcements.

What has been missing in the country's efforts to stimulate AI-driven innovation is a focus on improving the productivity of leading sectors within the current Canadian economy. Sector-specific tiny models for strategic Canadian verticals such as mining, energy, finance and manufacturing would play to the country's existing strengths while also bringing small and medium-sized enterprises (SMEs) into the AI innovation-and-iteration loop in the search for tangible productivity gains.

This focus would allow Canada to more accurately and realistically assess the country's AI-driven infrastructure and compute-power needs. The pursuit of artificial general intelligence requires massive amounts of compute power and dedicated data infrastructure (Vipra and West 2023). Tiny AI models, however, are designed for use in limited-resource environments (Ud-Din Cari, Mercury and Alaba 2024), allowing Canada to build upon existing national and regional infrastructure for sector-specific applications, such as fisheries in Atlantic Canada, manufacturing in Ontario, oil and gas in Alberta and so forth.

Such a focus could provide a counterpoint to leading AI companies such as OpenAI and Google, which often create unique barriers to adoption for SMEs (Ayinaddis 2025).

Similarly, their main Canadian competitor, Cohere, has heavily relied on government backing and a competitive advantage built on privacy and security. This strategy, however, echoes the approach that BlackBerry used in its final years, as it struggled to compete with Apple and Google in the mobile enterprise software market. None of these key players are focused on decentralizing the benefits of AI technology for SMEs, which are the backbone of most national economies, including Canada's. Ultimately, this shift in focus would be significantly more beneficial to the Canadian economy than investing hundreds of millions of dollars in a small number of organizations whose global competitiveness relies on government grants and contracts. The policy and funding focus in Canada must shift to encourage more players, more private capital, broader access to computational infrastructure and faster adoption in the AI ecosystem.

CANADA: A Framework in AI Leadership

The Warning from History and the "Seismic Shift"

For Canada, this moment feels familiar. The ghosts of past technological giants — BlackBerry in mobile, Nortel in telecom, Corel in software — should serve as a stark warning. However, there is a critical difference in that these examples from the past were vertical-specific disruptions. The AI revolution is a horizontal seismic shift that will touch every aspect of our economy (Bin Rashid and Kausik 2024). The stakes are infinitely higher. The following six-pillared CANADA AI framework provides a formula to ensure history does not repeat itself.

The Six Pillars of the CANADA AI Framework

To build a thriving, trustworthy AI economy, Canada must focus on a holistic, interconnected strategy. This playbook is built on the six pillars that form the acronym of the CANADA AI framework:

- **Collaboration and community:** Foster a robust, interconnected AI ecosystem that leverages Canada's industrial landscape.
- **Advanced algorithmic models:** Translate Canada's research excellence into cutting-edge, commercially viable AI algorithmic models, verticalized models and industry solutions.
- **Nurturing talent:** Overhaul educational paradigms and create new pathways to nurture and retain Canada's world-class AI talent.
- **Application and adoption:** Accelerate and incentivize the integration of AI across Canadian industries, showcasing real-world impact and driving productivity.
- **Data governance and ethics:** Establish Canada as a global leader in ethical AI and responsible data stewardship, built on a foundation of trust and transparency.
- **AI for all:** Promote inclusive and accessible AI development and deployment that benefits all Canadians and aligns with national values.

These pillars are neither abstractions nor bromides. As detailed below, each one represents a specific strategic objective for transforming the country's AI ecosystem, and comes with implementable policy actions to execute the shift.

Recommendations: Executing the Framework

Pillar 1 — Collaboration and Community: Forging a Connected AI Ecosystem

The strategy: Canada's strong research institutions and compact industrial landscape present a unique opportunity to build a deeply interconnected AI ecosystem. The goal is to move beyond isolated centres of excellence to a national network where insights, talent and data flow freely and securely, accelerating innovation and commercialization.

Actionable Policies

- **Establish a national AI collaboration platform.** This secure, federated platform would facilitate the sharing of non-sensitive or tokenized data, models and compute resources among researchers, start-ups and established enterprises. China's efforts to create data exchanges provide an example that Canada could draw from and innovate upon (He and Arcesati 2024). Building on existing communications and computing infrastructure, including CANARIE's[2] National Research and Education Network, as well as on existing policies such as the Pan-Canadian AI Strategy, this platform would expand opportunities for industry-academia partnerships, emphasizing data portability across sectors to foster an ecosystem of excellence.
- **Fund cross-sectoral and verticalized AI challenges.** Instead of individual company subsidies, allocate funding to "national grand challenges" (for example, AI for net zero, AI for pandemic preparedness, AI for advanced manufacturing). These challenges would incentivize multi-stakeholder consortia to address specific, high-impact national problems. Participants could leverage foundational Canadian AI capabilities, allowing them to focus on differentiated impact rather than mechanical technology development. This "AI+" concept (for instance, AI+health care, AI+quantum, AI+defence) would augment the national emphasis from discovery-based nodes to solution-oriented industrial capabilities. It would also focus and refine challenges related to data sharing and protection, allowing for swifter resolution and improved data protection.
- **Foster and strengthen regional AI hubs.** As consortia are formed to cultivate specific expertise (such as agricultural AI in the prairies, creative AI in Quebec, health-care AI in Ontario, post-quantum and AI in Kitchener-Waterloo, Ontario), these emergent regional AI hubs should be empowered and well resourced. This will foster local communities and attract targeted investment. Implementing talent mobility programs between hubs would further contribute to the formation of a unique Canadian AI fabric nationwide, enabling Canadian AI talent to roam between nodes of excellence, applying their core AI expertise in multiple verticalized centres of excellence while training new talent.

Pillar 2 — Advanced Algorithms: Decentralized Verticalization

The strategy: Convert Canada's world-class algorithmic expertise into cutting-edge AI solutions that tackle real-world problems. While LLMs are crucial for natural and fluid interactions with new AI systems and for generating conversations, there is a growing demand for computationally efficient tiny and small models designed for niche applications and specific vertical knowledge domains — innovations that will help industries and companies to adapt in their own context. Given that more than 95 percent of Canadian employers are small businesses, a key innovation focus can be on decentralized infrastructure that can connect small businesses regionally and across Canada to leverage AI for data, compute and algorithmic alliances. This presents a significant research and development (R&D) opportunity where Canada can truly excel.

2 Originally the Canadian Network for the Advancement of Research, Industry and Education.

Actionable Policies

- → **Invest in applied AI R&D:** Establish specialized funding channels to bridge the divide between theoretical advancements and practical implementations. These channels should foster collaborations among universities and Canadian enterprises, promoting the joint development of proprietary algorithmic models that are both computationally efficient and scalable within a decentralized framework.

- → **Launch a Canadian AI and data IP fund:** To prevent the "leaky talent bucket" phenomenon, where valuable IP in advanced AI algorithmics is often developed or acquired abroad, Canada should establish a national fund to support Canadian start-ups and researchers in protecting and commercializing their AI innovations, while also investing in data protocols, security, tokenization and portability. Such a fund would address a notable shortcoming of the federal government's Pan-Canadian AI Strategy,[3] whose provisions on commercialization and talent retention are heavily, if not exclusively, focused on Amii, Mila and the Vector Institute. Moreover, as agentic AI frameworks and agent-to-agent interactions become mainstream, such protocols will be invaluable.

- → **Promote open-source AI contributions:** Encourage Canadian contributions to global open-source AI projects, enhancing Canada's reputation as a collaborative leader and facilitating the adoption of advanced algorithmic practices. Note that open source does not mean free; as in the case of Red Hat, the principle is to harness the network effects of open-source solutions so that successful commercial ventures can emerge.

Pillar 3 — Nurturing Talent: Cultivating the Next Generation of AI Leaders

The strategy: Cultivate AI talent within Canadian high school and undergraduate programs through novel curricular frameworks that extend beyond the science, technology, engineering and mathematics (STEM) disciplines. Canada's current educational system is designed for a world that is quickly fading. The widespread availability and pervasive nature of LLMs are diminishing the generational knowledge gap. The author anticipates a future in which a 12-year Kindergarten–Grade 12 (K–12) program may no longer be a prerequisite for a high school diploma.

The emerging generation includes "Roblox natives" who are adept at navigating multimodal, asset-based, spatial and generative digital environments, and have engaged with AI more frequently than older demographics.[4] Without this crucial talent, Canada faces a significant setback in AI advancements compared to nations such as China, the United States and, notably, the United Arab Emirates, which recently established the Mohamed bin Zayed University of Artificial Intelligence — with its undergraduate program launching in March 2025.

Actionable Policies

- → **Mandate humanistic AI literacy (K–12):** Update educational programs to emphasize the core principles of data, metadata and algorithms, prioritizing critical thinking, digital literacy and supportive cultural narratives about AI. This approach aims to equip provincial elementary and secondary curricula for a future in which AI is pervasive and to cultivate a more profound grasp of its impact for students. Lessons can be drawn from the many recent initiatives to introduce coding into provincial curricula. These programs should be designed to be creative and inspiring, rather than adhering strictly to traditional STEM curricula. While Canada has been fortunate to have AI pioneers such as Geoff Hinton, the AI community now also requires figures akin to Robert Munsch and David Suzuki — namely, storytellers and inspirational figures.

- → **Pioneer a new design canon in post-secondary education:** Post-secondary education needs to evolve beyond traditional user-experience design to incorporate the unique challenges and opportunities of AI. Future curricula must emphasize designing for and with AI, focusing on principles such as managing uncertainty, ensuring auditability, mitigating bias and promoting participation over personalization. This shift is crucial for equipping students

3 See https://ised-isde.canada.ca/site/ai-strategy/en.

4 See https://kpmg.com/ca/en/home/insights/2025/06/canada-lagging-global-peers-in-ai-trust-and-literacy.html.

with the ethical and practical skills required for developing advanced AI interfaces. The foundational principles, moving beyond human-computer interaction (HCI), will be based on HCI2: humane, calm and intelligent interfaces.

- **Create structured AI apprenticeships and internships:** To bridge the academic-industry gap, Canada should develop national programs with industry partners to offer paid apprenticeships and internships, particularly for postgraduate AI talent. The "Canada AI badge" would signify proficiency in key areas, emphasizing skills crucial for the future workforce over traditional years of experience. These skills include human-AI symbiosis, efficient access to information, AI as a decision-support tool and collaborative AI empowerment. Such expertise will be more impactful than a traditional resumé for future Canadian talent.

Pillar 4 — Application and Adoption: Accelerating AI Integration Across Industries

The strategy: Canada's economic future depends on effectively integrating AI across its diverse industries, from traditional sectors such as banking, mining and manufacturing to emerging high-tech areas such as quantum computing. This pillar aims to significantly boost the adoption and application of AI, driving productivity gains and fostering innovation at scale, with the federal government facilitating platform access while allowing adopters to establish the processes they need to drive results.

Actionable Policies

- **Encourage Canadian SME AI adoption:** Create a shared resource hub to empower SMEs to overcome key barriers to AI adoption. This platform could provide access to best practices, case studies, technical support and curated AI solutions, given that as of 2025, only 12.2 percent of Canadian businesses reported using AI (Statistics Canada 2025). This directly addresses a critical gap in the market, given that firm-level AI adoption rates in the United States range somewhere between 20 and 40 percent (Crane, Green and Soto 2025).
- **Incentivize industry-specific AI sandboxes:** Establish secure regulatory "sandboxes" for specific industries (for example, financial technology [fintech] AI, health-care AI) to allow for the safe testing and deployment of AI solutions under relaxed regulatory conditions, encouraging rapid iteration and market entry.
- **Develop national AI use-case road maps:** Allow key industries to identify high-impact AI use cases and develop national road maps for their development and deployment, ensuring strategic alignment and efficient resource allocation.

Pillar 5 — Data Governance and Ethics: Building Trust in the Digital Age

The strategy: Canada possesses a strategic advantage not in consumer data, but in its extensive high-value enterprise and industrial data repositories across sectors such as banking, insurance, mining, health care and manufacturing. The objective is to transform this latent asset into a dynamic and contextual engine for "enterprise AI moonshots," while simultaneously positioning Canada as a global leader in ethical AI and responsible data stewardship, founded on trust and transparency.

Canada's concentrated sectors, such as banking and telecommunications, serve as a feature rather than a bug in this context. Their oligopolistic structure can facilitate coordinated data strategies — a more difficult feat in fragmented markets. Open banking exemplifies this potential, showcasing how network effects and industry alliances can forge new ecosystems among large banks, fintech companies, SMEs and consumers, with AI unlocking the value of separate and distinct legacy data sets once considered incompatible (a task AI can perform for similar legacy data sets such as health care). The potential societal and economic value of such networks is being lost amid regulatory and business conflicts among large financial institutions and emerging fintech and neo-bank companies.

Actionable Policies

- **Launch a national data alliance/interconnection mission:** The stalled open banking file, which sees Canada's efforts falling behind international peers (such as India's account aggregator framework), must be reframed as a critical test of national strategic will (Belli-Bivar and Cente 2025). More broadly, this mission would focus on secure, ethical and interoperable data sharing across

key enterprise sectors. Alliances can be forged among various entities such as municipalities, transportation agencies, health-care providers, utility companies and schools. Once these networks are established, a multitude of entrepreneurs and start-ups will emerge, creating unique AI ventures. These ventures will leverage the networks as secure data rails, seamlessly integrated with user consent.

- **Invest in enabling trust technologies:** Fund the development and adoption of privacy-enhancing technologies, as consistently advocated by regulators such as the Office of the Privacy Commissioner of Canada, to make secure, cross-industry data sharing possible. This directly addresses privacy concerns while unlocking the value of data.

- **Develop a national AI ethics framework with teeth:** To position Canada as a leader in trustworthy AI development and deployment, we must build upon existing ethical guidelines. This involves developing enforceable standards and accountability mechanisms that establish secure AI systems, especially in sensitive sectors, with the guiding principle of making data as open as possible and as closed as necessary. Tangible examples of these protocols should be demonstrated using national, provincial and territorial open data platforms, allowing their impact to be verified beyond presentations and whitepapers.

Pillar 6 — AI for All: Ensuring Inclusive and Value-Driven AI

The strategy: The final pillar ensures that all AI adoption is driven by a clear, strategic purpose, replacing the current tendency toward reactive, fear-based decision making. Much of today's enterprise AI procurement in Canada is driven by FOMO (fear of missing out) or reputational reasons, with many users admitting to using AI without fully understanding it or evaluating its outputs.[5] This leads to rushed decisions that threaten our data sovereignty and result in wasted investment. This pillar ensures AI development is aligned with Canadian values of inclusivity, equity and broad societal benefit.

Actionable Policy: The Strategic Intent Menu

Leaders in industry and government must formally ask and answer this question: Why do we need this AI? The purpose must be explicitly chosen: Is it to reduce costs, introduce new business models, make better decisions, mitigate risk or achieve scientific discovery? The chosen "why" determines the necessary type of AI. This intentional approach will ensure that AI initiatives serve a clear societal or economic benefit and are not just adopted for technology's sake.

- **Prioritize responsible and transparent AI development:** Incentivize the development of AI that actively addresses societal challenges such as climate change, health-care access and social equity, rather than solely focusing on commercial gains.

- **Promote AI accessibility and digital inclusion:** Implement policies, programs and tools that ensure equitable access to AI technologies and literacy for all Canadians, including underserved communities, to prevent a growing digital divide.

- **Champion public engagement and dialogue on AI:** Create platforms for ongoing public discourse about the societal implications of AI, fostering informed consent, managing expectations and building public trust in AI development and deployment.

5 See https://kpmg.com/ca/en/home/insights/2025/06/canada-lagging-global-peers-in-ai-trust-and-literacy.html.

Conclusion: Seizing the Promise of the CANADA AI Framework

The path to Canadian leadership in the AI era should not be a head-on race for scale with competing nations. It should instead mean the deliberate construction of a digital economy built on a foundation of trust, guided by the six principles of the CANADA AI framework. This framework will deliver the competitive advantage that comes from AI systems that are fair, transparent and accountable; from a workforce educated to be masters of technology, not its servants; and from a national strategy rooted in clear-eyed purpose.

As Canada's federal and provincial governments work together to identify priority nation-building projects, the focus has been on bricks-and-mortar initiatives for traditional sectors such as pipelines, mining and energy infrastructure, and marine ports (Thurton 2025). Canada's digital-economy infrastructure, and the leveraging of its AI leadership into real social and economic gains, must also rank among our top nation-building priorities. The CANADA AI framework described here not only provides a road map for integrating AI-driven innovation into the verticals of these traditional sectors, but it is also a nation-building project in its own right — one that will spark gains in competitiveness and productivity across the Canadian economy writ large.

By implementing this framework, Canada can not only secure its own future economic prosperity but can also champion a new global standard — leading by example to build a digital future that is innovative, equitable and worthy of our trust.

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