

Building Superclusters for Canada



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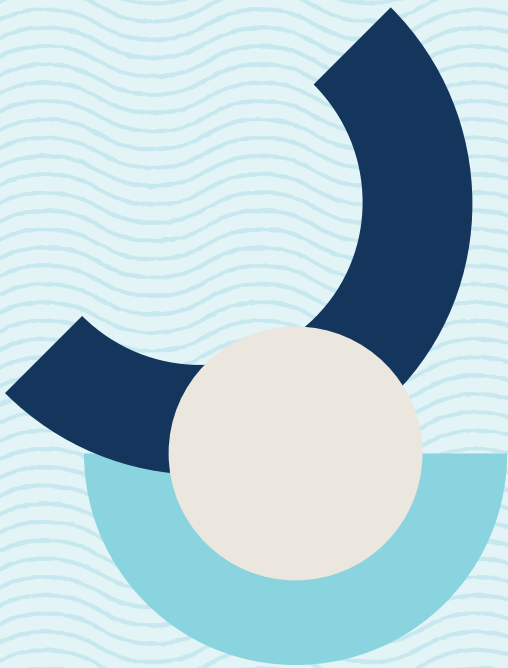
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Building Superclusters for Canada

AS THE DEPUTY MINISTER responsible for the launch and creation of Canada’s Superclusters, I observe that not many Canadians understand the concepts behind this initiative, its value proposition, and its place in innovation policy. The purpose of this article is to set out the rationale, accomplishments, and performance to date of the Superclusters—with reference to their origins and objectives, selection and launch, challenges and lessons, and performance and evaluation, and the way forward, including how they might fit in the rebuild or “reimagine” agenda of the Government of Canada after COVID. I make the case that Superclusters are best judged by a broad innovation policy framework and with a long-term time frame. They are all part of a business-led, demand-side policy experiment designed to improve Canada’s innovation performance.



Origins and Objectives

The concept of cluster development has been around for quite a few years. In the 1980s, many in Quebec (for example, Marcel Côté at SECOR) advocated a cluster approach to economic development. More recently, the concept was a focus of discussion in Canada as BlackBerry's fortunes declined, impacting Waterloo, Ont., and the sustainability of its leading engineering and IT activities. Over the years, the cases of Silicon Valley, Boston, and Austin, Texas, became models of cluster development. In the European Union, cluster development has a long history, with a range of initiatives in different countries and a secretariat imbedded in the European Commission.

Countries around the world have upped their game on cluster development. Many states in the U.S. have pursued a Michael Porter-type approach (1) to clusters, recognizing that the activities of Silicon Valley and the northeast corridor represent 25 percent of U.S. gross domestic product (GDP) (2). In Norway, it has created national, regional, and local cluster initiatives. Other cluster examples include Eindhoven in the Netherlands, with Philips at its centre; investment banking in Manhattan; and winemaking in Napa Valley, Calif.

The case for Superclusters is all about finding new solutions to Canada's continuously deteriorating innovation problems. This cannot be emphasized enough and explains why Superclusters were a signature initiative of a new Innovation and Skills Plan in 2015. Specifically, it was recognized that the long-standing way of promoting innovation in Canada—by using R&D tax incentives, maintaining a strong macroeconomic framework, and relying on supply-side supports for science and universities—was not working. Alarming, Canada was falling further behind in all measures of the global innovation and technology race—both in areas where it had traditionally been strong, as in government investment in science, and where it had always been a laggard among Organisation for Economic Co-operation and Development (OECD) countries, as in commercialization and business investment in R&D. Just doing the same old things would be very costly in terms of innovation and productivity performance (3).

In the specific area of cluster development, there were a number of key data points of concern for Canada. Overall, there were continued low levels of business R&D investment and a lack of scale in innovation initiatives. Business investment in R&D is traditionally lower in Canada than in other OECD countries—it ranked 22nd in 2016.

Canada also has a low density of networks and clusters. World Economic Forum and OECD data from 2018 indicates Canada ranks 16th in the state of cluster development, 19th for collaboration among businesses, and 19th in university-industry collaboration (4).

All this raised the question of what Canada could undertake new in innovation policy that would be impactful and change the poor trajectory of Canada's innovation record. Superclusters were recommended in 2015 to the new government under Prime Minister Justin Trudeau and the new minister of innovation, science and economic development, Navdeep Bains (5). They were seen as a fresh type of innovation policy, with objectives directly linked to traditional weaknesses of Canada's innovation performance. Here's a look at some of them:

LACK OF SCALE AND BUSINESS INVESTMENT: Winners in 2018 were kept to only five clusters with an investment of \$950 million in federal contribution over five years, to be at least matched by private sector investment. Past Canadian innovation plans have been criticized by policy analysts, media, and others for spreading dollars like “peanut butter” across the country and for initiatives failing because of their small scale.

WEAK BUSINESS-LED GOVERNANCE: The governance of the Superclusters and their boards puts business in charge of establishing of the strategies and providing direction to each Supercluster in terms of selecting individual projects and building cluster capacity. Traditionally, demand-side and business-led initiatives have not been the priority of innovation programming in Canada, with most initiatives being on the supply side. It was expected that business leadership would improve Canada's poor record of commercialization.

UNDERDEVELOPED SUPPLY CHAINS: Superclusters are designed to address weak supply chains among anchor firms, and small- and medium-size enterprises (SMEs), building new relationships and domestic partnerships. These supply chain relationships, which emerged with globalization,



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had not yet been a focus of innovation policy and programming in Canada, and their resilience domestically has become an even greater issue during COVID-19.

POOR SUPPORT FOR TALENT: The Superclusters are intended to retain and build on strong Canadian talent in key technologies and related businesses. For many years, Canada has been challenged by the exodus of talent in the science and technology fields to the U.S. and around the world. In addition, labour market policy has also been dominated by supply-side initiatives, and the Superclusters allowed more business-led investments in talent in areas of new technologies.

LACK OF FOCUS AND BRANDING: By the creation of these Superclusters, Canada becomes known as a global innovation leader in five specific areas. In this respect, many countries and businesses outside Canada are unaware of its leadership in technologies and sectoral strengths—“Mounties, mountains and moose” being the known generic brand.

WEAK NETWORKS: The Superclusters serve to promote strong ecosystems and networks, including those in new digital and intellectual property (IP) strategies. Canada has not promoted

cluster development in the way other countries have in their innovation policies, and, as mentioned above, the data shows a low density of networks and collaboration. The new Innovation and Skills Plan included some first steps toward more comprehensive digital and IP framework strategies, and Superclusters were seen to be part of these.

All of the Supercluster objectives reach beyond the impact of their individual projects to promote benefits from new technologies and networks that partner and learn innovative, new practices over time—so-called “network effects.” In Canada, the benefits of these effects have been often overlooked.

Selection and Launch

Selection of the Superclusters was based on a competitive two-phase process over the period of about a year. The selection method was intended to be a “grand challenge” based on meeting the mission of creating a global-leading cluster in a specific area in Canada—all to improve Canada’s innovation and productivity performance.

The first phase attracted more than 50 letters of intent, which represented over 1,000 businesses and 350 other participants from all regions of Canada. Officials from across government departments and agencies (such as the National Research Council Canada) conducted the initial assessments. Out of more than 50 proposals, nine applicants were invited to advance to the second phase and submit detailed project proposals. In this second round of review, outside experts joined government officials to assess and recommend the five winners.

The five Superclusters were announced in 2018 with a government investment of \$950 million over five years to be matched by business investment and to be business-led. They are Digital Technology (British Columbia), Protein Industries Canada (Prairies), Next Generation Manufacturing (Ontario), Scale Artificial Intelligence, or Scale AI (Quebec), and Ocean

(Atlantic Canada). Other proposals in the last round that did not win awards were for aerospace, mining, oil and gas, and infrastructure. No one remembers who exactly coined the term “Superclusters.” On one hand, it is a simple brand, capturing its aspirational aspect; on the other, it confuses many.

Overall, there was a rigorous process of review and assessment of each application involving outside parties and experts. The two-stage competition showed depths of strength across the country that even surprised policy analysts and policymakers. The winners reflected strengths in networking, new technologies, supply chain development, leveraged investments, digital adoption, and potential commercial applications across and within sectors and regions. The choice of five Superclusters reflected the desire to ensure cluster activity beyond traditional urban technology centres. It was also recognized that each Supercluster would have its own unique pace of development, and success would vary, even with a risk of failure.

For the launch of each Supercluster, long-term GDP and jobs targets were developed, using the advice of outside experts. These were benefits Minister Bains personally highlighted as part of demonstrating the value proposition of the program to Canadians. He said focusing on jobs and GDP was the only and best way to explain the complex innovation benefits of Superclusters to the “person in the street.”

We all understood the need for simplicity, yet focusing on these two goals masked the key objectives of the programming related





“Developing project proposals brought together firms and organizations that had never talked before.”

to innovation policy—technology leadership, collaboration, business-led investment, talent retention, and commercialization. The outcomes of jobs and GDP do, nevertheless, rightly signal to all that the Superclusters are about not just individual projects but also longer-term benefits to the real economy.


A common refrain from applicants at both phases of the selection process was that “developing a project proposal was bringing together firms and organizations that had never worked or talked before—creating new partnerships.” This comment signalled progress in building networks and partnerships, yet it also revealed once again Canada’s long-standing weaknesses in innovation, specifically in technology partnerships and networks.


Challenges and Lessons


Since 2018, each Supercluster has established its own business model, processes, and structure, taking direction from its independent business-led boards. New partnerships based on memberships and commercial projects have been announced. Each has developed a vision and strategy for the long-term. These strategies address the gaps in the various ecosystems of each Supercluster, including those relating to the application of new technologies, supply chains, digital practices, and attracting inclusive talent, as well as promoting

innovative behaviours, especially among businesses.

Attached in annex A is a summary report on each Supercluster in terms of its goals, focus, achievements, project examples, and ecosystem development. The evolution of each has been different in terms of scope and pace.

 **DIGITAL TECHNOLOGY SUPERCLUSTER:** It has established a network of 900 members to find digital solutions for deploying, developing, and scaling new applied technologies. It has three areas of focus: health, natural resources, and training. The talent support offered is inclusive (marginalized groups, youth, and women) and involves engagement of incubators and start-ups as part of its ecosystem development. It moved to deploy COVID-19 projects in March 2020. Sixty percent of the projects are B.C.-based companies. There is a portfolio of 68 projects with a total value over \$200 million.


 **PROTEIN INDUSTRIES CANADA SUPERCLUSTER:** This network of 257 organizations is aimed at increasing ingredient processing and food manufacturing of high-protein Canadian crops to meet the growing global consumer demand for plant-based foods. It is the Supercluster most defined by a vertical focus in one sector, agri-food, and it is centred on crop production in the Prairies. This Supercluster is notable for its export orientation and promotion of new value-added activities in Canada before shipment abroad. It has partnerships with the Global Institute for Food Security at the University of Saskatchewan, the University of Guelph, and Olds College in Alberta. There are 21 active projects with a total investment of over \$320 million.

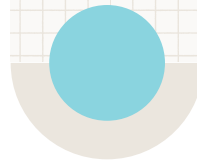
 **NEXT GENERATION MANUFACTURING SUPERCLUSTER:** This is the largest of the five networks, with 3,100 members, one-third of which are based outside Ontario and the vast majority of which are SMEs. About 2,000 members are businesses and associations. (This Supercluster has a three-tiered membership structure with businesses, associations, and individuals as participants.) The focus is broad by definition, with the aim of



promoting adoption and integration of all aspects of advanced manufacturing. This Supercluster was the first to pivot during COVID-19 to the manufacture of pandemic-related products for Canada, including personal protective equipment (PPE), medical devices, test kits, and robotic disinfecting systems. It is also known for holding workshops and events to promote awareness of advanced manufacturing technologies. This has involved links to a wide number of colleges and universities across Canada, as well as to incubators, and research and innovation centres to enhance advanced technology management and the scale-up of SMEs. It has almost 70 projects in train, valued at about \$350 million.

 **SCALE AI:** This Supercluster is a network with 1,345 members. Relative to the technologies in other Superclusters, the application of AI to commercial products and supply chains is in its early stages. This has led Scale AI to create chairs for professors in university business programs. Its business partnerships have also been more oriented to large anchor firms than other Superclusters, based on the view that this is where investments need to start and new technologies established, which would then spill over to SMEs. In addition, to ensure the foundation for a future AI ecosystem is established in Canada, Scale AI has launched training programs in science, technology, engineering, and math (STEM), and for incubators and start-ups. The portfolio to date has over 70 projects worth about \$170 million. (All Superclusters have funded applications of AI in their individual areas too.)


 **OCEAN SUPERCLUSTER:** This is a network with 360 members, 40 percent of which are outside Atlantic Canada. This Supercluster involves projects that represent collaborations across very different sectors and regions that nevertheless share the ocean economy. It is marked by cross-sectoral collaboration in new technologies that span fisheries, aquaculture, offshore oil and gas, defence, marine renewables, shipping, and bioresources. Its training activities supporting the ocean ecosystem have been inclusive in terms of involving Indigenous people, youth and women.




There are 49 projects approved, valued at close to \$250 million.


Three Superclusters—Digital, Protein, and Next Generation Manufacturing—are now indicating they will be fully committed in spring 2021, in part because of the pivot to COVID-19 projects. These three are seeking top-up funding before the end of the five-year cycle in March 2023. All Superclusters have strengthened their project pipeline over time and are expected to seek renewed funding in advance of the end of the initial five-year period. The federal program has committed \$510 million in funding as of the end of January (6).

There are a number of common challenges that have surfaced in the establishment of these Superclusters. These experiments in new innovation policy have not been without issues, and given they were new instruments, this is not entirely surprising. Here is a look at the challenges:

 **GOVERNANCE:** It took considerable time for Superclusters to establish governance in negotiations with the Government of Canada. Those involved in the public and private spheres collectively recognized the importance of getting governance right for the success of the Superclusters. This included forming the board of directors with anchor and SME members, establishing program selection

processes, putting reporting requirements and secretariats in place, and establishing five-year strategies. The Government of Canada introduced requirements that were perhaps too rigorous, some driven by the Treasury Board, concerning board composition, how to flow funding, and annual reporting, focusing on accountability to taxpayers. In hindsight, there might have been more flexibility as Superclusters were set up. This flexibility was intended by government officials using a principles-based rather than a prescriptive set of requirements. On one hand, these Superclusters are to be business-driven; on the other, the program requires accountability to Canadian taxpayers for large sums of public dollars.

 **TIME TO FIRST PROJECTS:** The Parliamentary Budget Officer (PBO), Yves Giroux, and others in the media have criticized the Superclusters as being slow off the mark in terms of project commitments and spending (7). This criticism may have reflected the point in time when the PBO assessed the spending and supporting data—in the third quarter of the year. Typically, especially early in the life of programs, spending is back-ended in the fourth quarter. Moreover, the Supercluster program is not your typical granting program that’s just about getting project money out the door. It involves co-investment, which means private-sector outcomes and investment must be established before taxpayer dollars are announced and received. It is also about capacity-building initiatives that support the ecosystems involved and selecting the projects that fit with the related long-term strategic objectives in sight. It seems the Superclusters were expected to produce end-stage projects prior to doing the hard work of building out their relationships and figuring out what they are to do. Simply put, these Superclusters are not about signing off on the first projects that show up at the door.


 **PROCESS INNOVATION VERSUS TRANSFORMATION:** Each Supercluster was tasked with creating collaborative innovation, and this led to dialogue and choices about pursuing large transformations or smaller process innovations in projects. A big


question for each Supercluster has been: Do we look for large projects that have significant, transformational impacts, or do we rely on smaller projects that are process innovations, part of an iterative process leading to significant innovation? It has been easier at the outset to undertake smaller projects.



“Each Supercluster has established a business model aimed at moving the dial of Canada’s innovation performance.”

 **NEW SUPPLY CHAIN LINKAGES:** Each Supercluster found challenges in building new supply chain relationships. Large industrial players in Canada have a track record of adopting technologies from “proven” solutions, often from foreign technology companies, especially those in the U.S. Given their size and requirements for sign-off from headquarters, they are often slow to adapt and change. At the same time, SMEs are more agile, yet Superclusters confronted the fact that Canada’s SMEs are typically small and have limited capacity to create and adopt new technologies in a way that allows participation in global supply chains with large anchor firms (8).

 **BUILDING THE ECOSYSTEM VERSUS SELECTING PROJECTS:** Some involved in the Superclusters have remarked that they have learned that capacity building and project selection require different skills and backgrounds. So ensuring a board has both capacity-building and business investment skills is important. Even more important is connecting and bridging the two activities, and ensuring the constant application of a strategic vision and framework for each Supercluster (9).



REGIONAL VERSUS NATIONAL SUPERCLUSTERS: Each Supercluster has a geographic concentration. There is no question that proximity and density are important for a strong ecosystem. Each has been challenged to reach out nationally beyond its region. Questions remain concerning the right balance of activities in this respect. The ecosystem gaps vary considerably with these different lenses of region versus nation and the effort required to succeed.

ENGAGEMENT OF PLAYERS: Among all Superclusters, there have been common challenges related to creating the desired inclusive networks. At the outset, the boards tended to be dominated by large anchor firms. Over time, SME members relevant to their priorities were identified, as well as roles for universities and colleges, and provinces. Some people representing existing incubators and accelerators argue that Superclusters tended to build new activities rather than connect to the ecosystems' existing assets. Each has found a different approach to getting the right mix of players in its network, dependent, in large part, on its areas of focus.

IP AND DIGITAL DATA GOVERNANCE: There was a desire by the Government of Canada for the Superclusters to promote a dialogue among firms on the strategic use of IP, both in terms of its protection and the use of open innovation where IP is shared. This was consistent with the new IP Strategy the government announced in 2018. In negotiations between the government and the Superclusters, these issues unfortunately became confused and legalistic. Some in business understood the Government of Canada to mean all projects required open IP and innovation. This was not the intent—rather, it was to allow for education concerning the need for IP protection, as well as for the use of shared IP, if it made sense. Specifically, there was an expectation that Superclusters would lead to new practices concerning digital and data analytics, as well as IP.

BRANDING CANADA GLOBALLY: A pleasant surprise and challenge for all involved was the tremendous interest in the Superclusters, first by the European

Union countries and then by others in the Asia-Pacific and the U.S. A common refrain from those in other countries was, “This finally explains to me where Canada has global-leading innovation activities.” Each of the Superclusters nevertheless had to carefully manage these international interests and demands as it focused on building its activities domestically.

These challenges suggest several lessons.

- On the governance issues, boards, secretariats, and the Government of Canada need to focus more on outcomes and less on bureaucratic inputs—all to support stronger, increasingly adaptable, and flexible business-led activity.
- Building resilient and stronger supply chain relationships in projects—and among anchor firms and Canadian SMEs—deserves more attention, especially after COVID-19. More participation of Canadian SMEs in supply chains promotes scale-up and facilitates technology spillovers.
- In many areas, Superclusters have just started their innovation work, and from a long-term perspective, lessons are only beginning to be drawn in each cluster about the gaps in their ecosystems, including those relating to cross-sectoral and multidisciplinary dimensions, national scope, and new partnerships.

- In the area of digital data and analytics, a dialogue has only begun within the Superclusters and among their members. Associated with this is the use of more open collaboration and shared IP, which is often cited as a trait of the Silicon Valley and Boston innovation ecosystems. The importance and benefits of these digital issues were only dramatized by the role of big tech and e-commerce in the pandemic.

Performance and Evaluation


Assessing the performance of Superclusters is no easy matter, and it is relatively early in the life of these five-year initiatives to make final judgments. Formal evaluations are to follow. Building ecosystems and investing in related projects is a long-term game, even beyond the planned five-year period.

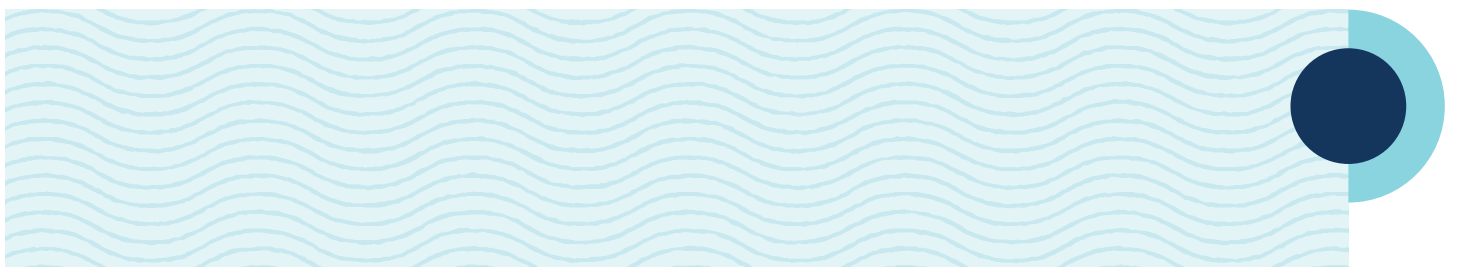
It is important to recognize that each Supercluster has evolved independently based on its area of focus and priorities. The two in the West—the Digital and Protein Industries Superclusters—have been the most successful in terms of launching governance and projects. Next Generation Manufacturing was perhaps the slowest to start, encumbered by a large number of members, as well as the launch of a broad set of ecosystem supports for diverse manufacturing activities. It was nevertheless the first to pivot to other activities during COVID-19, and this work has been a primary focus. The Scale AI and Ocean Superclusters have launched but with a slower pace. Scale AI is building pre-commercial links as a priority, and the Ocean Supercluster is

confronted by the challenges of creating new networks across very different sectors and businesses that have not traditionally engaged with one another.


With respect to technology benefits—the priority objective—the Superclusters have brought new integrated technology solutions to Canadian firms, and commercialized new products and services, as demonstrated by the project examples in the annex. At the beginning, some companies, especially larger ones that were original members, thought this was a traditional granting program that could be used to fund their own “off-the-shelf” projects within their existing supply chains. Some big players withdrew from the Superclusters, especially in advanced manufacturing. Over time, the adoption and creation of new technologies have nevertheless been successfully encouraged, where large companies and Canadian SMEs work together to find integrated technology solutions to a series of mission-oriented problems involving new partnerships. However, project size is relatively small on average, suggesting that Superclusters are often developing what could be called “pilots,” and to date, innovation is more incremental than transformative.


In terms of performance, the Superclusters show positive results in the following areas.

 **BUSINESS INVESTMENT IN INNOVATION:** Business has stepped up to invest in the Superclusters—all are on track to meet and exceed the 1:1 matching requirement. The data to date suggests private-sector investment overall could well exceed government investment by 1.4:1 by the end of the five-year period (even taking into account that the



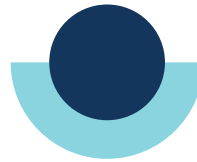
1:1 matching requirement was relaxed for COVID-19-related projects).

 **NETWORK EFFECTS:** Right from the start of the application process and as part of the Superclusters' launch, new partnerships and networks have been created, bringing together firms that had not talked to one another before. There are almost 5,000 business members in the five Superclusters. Of the projects announced, there are 870 partners, over 470 of which are SMEs.

 **INCLUSIVE TALENT AND TRAINING:** All of the Superclusters have launched training programs that support building and maintaining foundations in their fields with inclusive talent, including youth, women and Indigenous people, as well as with incubators and their start-up firms. This labour market work is business-led, in contrast to the long-standing, more typical supply-side activity in support of the labour force. This work is focused on both training new employees and offering continuous learning for existing employees in new, disruptive technologies. In terms of inclusion, this broadens who benefits from the innovative activities, and more diverse talent tends to promote more diverse ideas of innovation.

 **INTERNATIONAL BRANDING AND PARTNERSHIPS:** In response to the very positive interest in Superclusters expressed by other countries, each one is now in the process of building some project or firm-based international partnerships—for example, the Digital Supercluster has engaged India on clean technology, and the Ocean Supercluster has pursued digital ocean monitoring and aquaculture partnerships in Norway.

Given the general lack of understanding of the scope and nature of Superclusters, establishing a formal evaluation framework is a priority. While the Government of Canada will require and mandate an internal evaluation for the Department of Innovation, Science and Economic Development (ISED), I recommend the engagement of a third party now to establish an ongoing evaluation framework

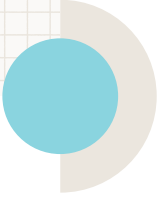


“Building ecosystems is above all a long-term game.”

for the Superclusters. This would be led by the secretariats supporting the Superclusters and used to guide strategies and communications. While more work needs to be done in this regard, the assessment of Superclusters is best determined by a broad framework defined by the following success factors.

- **Technology benefits:** The measured impacts of Superclusters in terms of incremental process changes, as well as transformational, signature projects
- **Network effects:** The development of the associated ecosystems and business networks—how each Supercluster is more than the sum of its parts
- **Demand- and business-led attributes:** How investments are business-led, not government-led or supply driven, in the various ecosystems
- **Higher business investment in R&D:** Demonstration that business has made substantial and incremental R&D investment





- **Multi-sectoral and multidisciplinary elements:** Evidence of new types of collaborations
- **Emergence of intangible assets:** More adoption of digital and IP practices, including some open technology partnerships
- **Commercial benefits:** An improved track record for Canada in terms of commercialization, including the start-up and scale-up of Canadian firms in the activities of the Superclusters
- **Supply chain resilience:** Demonstration of new, resilient supply chain relationships and connectivity of networks
- **Training and talent benefits:** Keeping leading technology talent in Canada and promoting an inclusive workforce capable of adapting to the needs of new technologies and business models
- **Global partnerships:** Recognition of the Superclusters through new international partnerships among firms, especially beyond the U.S.

Above all, the Superclusters should be judged by how they move the needle on Canada's innovation performance. This means using innovation metrics that provide a picture of how well they create socio-economic value in both qualitative and quantitative ways. The PBO assessment of the Superclusters was at the very least premature and, in any case, based on a narrow evaluation framework, as if the purpose was merely projects.

Yves Giroux was hardly alone in this view, which was also held by some leading large businesses and their associations. But the Superclusters' factors of success are as much qualitative as quantitative in terms of how the ecosystems have been improved and how individual projects contribute to not just their direct outcome but also capacity building and networks of innovation. This kind of broad evaluation requires a mindset change on the part of critics and evaluators, with a greater focus on measuring outputs and outcomes that match up to the real economy and the ecosystems at play, as opposed to simple project evaluations and measures.

The Way Forward

As Canada moves out of the COVID-19 pandemic and the economic shutdown, policymakers will be assessing what can best help restructure the Canadian economy and put it on a strong, inclusive, and sustainable growth path. Superclusters may not be currently at the top of any rebuilding list—for obvious reasons related to the considerable challenges of the health sector and the series of economic shutdowns that have threatened the liquidity and survival of so many firms. Yet there is a case for supporting the renewal of these Superclusters, and nurturing and building them even further in the post-COVID-19 economy. This is especially true if the Government of Canada's goal is to “reimagine” the economy.

By their very nature, Superclusters directly support a renewed Canadian economy that is

more resilient, innovative, and diversified. Higher business investment in R&D is channelled through the Superclusters with supportive investments from governments, strong network effects resulting from collaboration among firms, and more successful commercialization, diversified trade, and value-added outcomes.

There are three arguments to consider in terms of the way forward.

1 CANADA CONTINUES TO BE IN A TECHNOLOGICAL RACE post-COVID-19, in which it needs scale and focus in a limited number of areas. If anything, this technological race, led by the U.S. and China, will only intensify as all compete for global economic leadership. This means Canada needs bold, scaled, business-driven initiatives like the Superclusters. The commercial and business sides of the Superclusters can evolve even further so the network and partnering effects of their activities take more of a life of their own, and the projects' technological benefits can become more transformative and impactful. This could include more connectivity than it does now, bringing together all policy and business instruments and players in support of the clusters. Also, new international business partnerships could be created to strengthen the cluster development for value-added trade and to enhance Canada's brand in these areas.

2 THIS EVOLUTION COULD ESPECIALLY STRENGTHEN SUPPLY CHAINS in Canada, and produce an even greater mission orientation. This means a fundamental part of the upcoming work would involve helping Canadian firms adopt and create new technologies—at scale—so that anchor firms can find technology solutions by partnering with them. Many of the Superclusters have undertaken versions of mission-oriented projects, in which solutions to societal challenges such as COVID-19, health care and climate change are found, and businesses, governments, and other third parties work together with greater scale and connectivity to find them. This could also include demand-side procurement practices. More can be done to help improve Canada's culture of innovation using

sector-agnostic social and environmental missions.

3 THE SUPERCLUSTERS' SUPPORT OF COVID-19 PROJECTS suggests that each can pivot again, as required, and leverage its business model to deliver on shorter-term needs while growing the impact of other longer-term objectives. The national agenda being proposed for making the economy sustainable, green and net zero is a case in point. The ability of the Superclusters to pivot to address new issues is a sign of success and



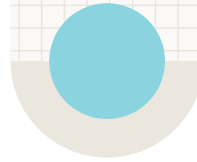
“Superclusters makes good sense for Canada from the perspective of a broad innovation policy and evaluation framework.”

adaptability. These traits of flexibility and adaptability are an important part of successfully building back our economy. Moreover, developing the work of the Superclusters in the health sector, including manufacturing, would be a logical outcome of their pivot to help support COVID-19 management.

IN CONCLUSION, let me make some remarks on the vision underlying the Superclusters and from a 50-year outlook, one not commonly taken by Canadians yet important for truly reimagining the way forward. A very challenging, long-term aspect of the Superclusters relates to what many call the “secret ingredients” at the heart of their ecosystems—or how each takes on a life of its own, creating hyperconnectivity, shared goals, common resources (especially risk capital and talent), and a culture of innovation. The cases of Silicon Valley and Boston typify the existence of these elements of a “secret sauce,” or what

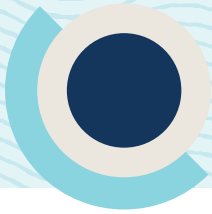
might also be said to be the Keynesian “animal spirits.” Commentators and skeptics often think these ingredients cannot be replicated. In *An Entrepreneurial Canada?*, Philip Cross wrote about how innovation is like biology, with dynamic and evolving elements, and how they best fit together, change, and evolve over time (10). This makes the assessment of success and impact challenging and not always best defined simply by traditional quantitative measures of innovation.

Can these Superclusters evolve to be living organisms driving a leading global innovation culture in Canada? Flying from Ottawa to give a speech in Vancouver to the Digital Supercluster board in November 2019, I happened to select the film *Echo in the Canyon* to watch. It turned out to be all about innovation and the secret ingredients relevant to the assessment of Superclusters. Bear with me as I elaborate! This is a film by Jakob Dylan, the son of Bob Dylan, about a suburb of Los Angeles in the 1960s called Laurel Canyon, and the impact of events that took place 50 years ago. The film sets out the transformation and emergence of folk rock as a leading music genre, led by groups like the Byrds, the Mamas and the Papas, Buffalo Springfield, the Beach Boys, and the Association. The story, as told, reports how this small place brought music innovators together into a concentrated area yet, at the same time, was linked to New York, Nashville and the U.K. music scene, especially the Beatles and Eric Clapton. The talent was extraordinary, coming from all different backgrounds and places—truly a dynamic network of musicians. The collaborations and partnerships were extraordinary too, marked by constant jams in Laurel Canyon and the open sharing of ideas and riffs. There are scenes in which musicians talk and laugh about copying and openly using chord progressions originally made by others to produce examples of the transformative new genre. The protection of copyright and IP in this context gave way to open collaboration. The musicians speak about the spirit of innovation and sharing that created this “special sauce,” and a revolution in folk rock music and the vibrant ecosystem of Laurel Canyon.



So with a long-term outlook of 50 years, I could see a leading Canadian entrepreneur with the credentials of Bob Dylan’s son eventually making a film called *Echoes in the North*. It would highlight how Canada’s culture of innovation markedly changed and improved as a result of these Superclusters. No doubt two or three would have been more successful than others, and each would provide different lessons about innovation. As a group, they would be seen as a symbol of Canada’s leading culture of innovation and an example of Canada being willing to experiment with business-led, demand-side initiatives in how to create innovation. They would be recognized as a significant contribution to the economy and society by all political parties and innovation policymakers. Above all, Superclusters would have demonstrated the leadership of Canadian businesses and their ability to turn the country’s strong science and talent into commercial outcomes based on networks of collaboration.

That’s all to say that if Canada wants to win at the long-term innovation game, placing more bets on its five Superclusters makes a good deal of sense from the perspective of a broad innovation policy and evaluation framework.



Annex A: Canada's Superclusters

BRITISH COLUMBIA

Digital Technology Supercluster

GOAL: Global leadership in digital business solutions—developing, deploying, and scaling applied, digital solutions through partnerships and collaboration.

AREAS OF FOCUS: There are three areas of focus: the health sector, sustainable and carbon-neutral natural resource applications, and digital training. In March 2020, this Supercluster deployed COVID-19 digital solutions to faster diagnoses, and

access to virtual health services and food supply security.

ACHIEVEMENTS TO DATE: There is a portfolio of 68 projects with a total value of over \$200 million, of which \$100 million has come from industry. The network involves almost 900 organizations, with 9,000 jobs and over 100 digital products and services. More than 120 SMEs in Canada are involved in projects; 60 percent are based in B.C.

Project Examples

ABC PROJECT (\$4 MILLION): This Vancouver East side initiative applies digital solutions to the authorization, booking, and co-ordination of testing and vaccination requirements (including COVID-19) for vulnerable populations.

EARTH DATA STORE PROJECT (\$3.9 MILLION): A digital platform that uses earth observation satellite data is applied to forecast extreme weather events such as floods and forest fires.

COVID CLOUD PROJECT (\$5.1 MILLION): Led by DNASTack, this initiative is designed to better understand the COVID-19 virus and its variants, using a DNA platform for data sharing to provide scientists and decision

makers with real-time information. Public Health Ontario and Ontario Genomics have deployed COVID Cloud in their monitoring of public health measures and vaccination efforts.

ECOSYSTEM DEVELOPMENT: The Digital Supercluster has a dedicated training program, the Canadian Tech Talent Accelerator Project (\$8.7 million). It promotes digital skills, leadership development, and inclusion initiatives that provide pathways for Canadians to transition to the digital economy. In a recent survey of its members (August 2020), 65 percent of members say the Supercluster has enabled them to develop new business relationships and partnerships.

PRAIRIES

Protein Industries Canada Supercluster

GOAL: Position Canada as a global leader in the supply of plant-based ingredients, feed, and food, potentially adding \$12 billion annually to the Canadian economy and processing an extra 20 percent of Canadian crops.

AREAS OF FOCUS: Processing of high-protein Canadian crops (such as lentils, peas, and fava beans) into plant-based ingredients

and food for domestic use and export, while increasing value-added activity in Canada.

ACHIEVEMENTS TO DATE: Protein Industries Canada has 257 members, with representation coast-to-coast. There are 21 active projects, involving 79 SMEs, with government and industry committing more than \$300 million to Canada's plant ecosystem.

Project Examples

MERIT FUNCTIONAL FOODS (\$19 MILLION):

This project applies a new technology to process high-protein crops into a pure form that can be easily blended into products such as non-dairy ice cream and drinks. Construction of a new Winnipeg plant created 240 jobs, and the project led to an additional \$100 million in investment in the company and contracts with large food companies like Nestlé.

PRECISION AI (\$26 MILLION): This partnership involves Precious AI, Sure Growth Solutions, Exceed Grain Marketing, and the Global Institute of Food Security. Drone technology will use AI to apply herbicide only on detected weeds, helping to improve sustainability of crops. Since the project announcement, Precision AI has received further investment from Business Development Bank of Canada, Sustainable Development Technology Canada, and private investors.

PRAIRIE FAVA (\$19 MILLION): A partnership between Roquette, a large globe-leading company in plant proteins, and an SME, Prairie Fava, was created to apply new nutrition and processing solutions for peas and fava beans, increasing the value of Western Canadian-grown crops, leading to new products and increasing value from field to fork.

ECOSYSTEM DEVELOPMENT: This Supercluster complements its project investments with activity in seven ecosystem priority areas: labour, skills, and access to talent; regulatory modernization; data and ICT management; intellectual property literacy; infrastructure; access to capital; and global brand and international engagement. In each priority area, work is done collaboratively with academia, research centres, and NGOs, as well as Indigenous and other under-represented groups.

ONTARIO

Next Generation Manufacturing Supercluster

GOAL: To enhance and leverage Canada's research, technology, and manufacturing strengths, and related workforce skills, to build world-leading advanced manufacturing capabilities.

AREAS OF FOCUS: The application of new-generation technologies in all manufacturing activities. In March 2020, the Supercluster pivoted to support the COVID-19 response by promoting the domestic production

of critical equipment supplies, notably ventilators, test kits, and PPE.

ACHIEVEMENTS TO DATE: By December 2020, almost 70 projects have been approved with about \$350 million in new innovation spending, of which \$210 million comes from industry. One-third of project partners are based outside Ontario. There are 3,100 participants as members, of which about 2,000 are businesses and associations.

Project Examples

ASPIRE FOOD MANUFACTURING PROJECT

(\$16 MILLION): Led by Aspire in London, Ont., with partnerships involving Telus Agriculture, A&L Labs, Swift Labs, and DarwinAI, this project will lead to a fully automated food-processing facility that produces insect-based protein powder. The total project cost is \$72 million, employing 600 in the project and ultimately 2,000 in the facility.

PANDEMIC VENTILATOR PROJECT (\$5 MILLION):

Led by StarFish Medical, based in Victoria, B.C., this project involves the redesign, recertification, and manufacture of an older ICU ventilator originally developed in Winnipeg. To date, the consortium has \$170 million in procurement orders.

DIGITIZED STEEL PROJECT (\$3.9 MILLION):

This project is led by ArcelorMittal Dofasco in Hamilton, Ont. It involves three other business partners, along with research teams from Mohawk College; the Universities of Toronto, Windsor and Western; the National Research Council

Canada; and Natural Resources Canada. It integrates a variety of advanced technologies into steel making, including special sensors, the internet of things, artificial intelligence, advanced materials, and robotics.

ECOSYSTEM DEVELOPMENT: To strengthen Canada's advanced manufacturing ecosystem, the Supercluster supports online tools to connect members to new global and domestic commercial opportunities; cluster development for activities in wood products, mining equipment, aerospace, automotive, nanomedicine, and clean tech, for example by deploying digital tools for virtual training, partnerships, and trade shows; training programs relevant to advanced manufacturing, with diversity and inclusion a theme; and development of standards, testing, and certification, as well as quality-assurance programs that help commercialize advanced manufacturing technologies.

QUEBEC

Scale AI Supercluster

GOAL: Build a world-leading hub for AI and intelligent supply chains, especially for transportation logistics and health.

ACHIEVEMENTS TO DATE: There is investment in more than 70 projects, worth just over \$170 million. There are 1,345 members. Projects are led by larger firms, yet SMEs benefit as service providers, with 70 percent of funds

flowing to them, generating \$1.80 of private investment for every \$1 the Government of Canada invests. The Supercluster has also created AI chairs for professors in university business programs to support the translation of the leading AI science in Canada and Montreal into business applications.

Project Examples

ACCELERATION PROGRAM (\$20 MILLION): Scale AI has created partnerships with accelerators and incubators to promote AI supply chain start-ups: 24 incubators and accelerators were certified, with 150 start-ups under consideration for the program.

WORKFORCE TRAINING PROGRAM (\$53 MILLION): It has supported 89 training programs, targeting close to 10,000 individuals by 2023.

COVID-19 INITIATIVE TO SUPPORT HOSPITALS (\$10 MILLION): This initiative produces AI applications to better manage operating room resources and backlogs for COVID-19 and other diseases, such as cancer.

ECOSYSTEM DEVELOPMENT: Scale AI has benefited from significant investment by the Quebec government. The Supercluster in turn has invested \$1 million in STEM outreach to encourage over 12,000 youth to pursue studies and careers in data science and AI. This complements support for other training, and incubators and accelerators across the country, providing Canadian start-ups with support from Canada's top AI experts.

ATLANTIC CANADA

Ocean Supercluster

GOAL: To make Canada a global leader in ocean technologies across a wide range of sectors, and to bring together traditional fisheries, aquaculture, offshore oil and gas, defence, marine renewables, bioresources, shipping, and ocean tech to commercialize global solutions and grow Canada's ocean economy in sustainable, digital, and inclusive ways.

ACHIEVEMENTS TO DATE: There are 49 projects with almost \$250 million invested, of which business has invested 50 percent, resulting in more than 100 new ocean products, processes, and services. Over 80 percent of the Ocean Supercluster projects are led by SMEs. It is based in Atlantic Canada, with 40 percent of its 350-plus members from outside the region.

Project Examples

OCEAN AWARE PROJECT (\$29 MILLION): A collaboration across ocean sectors in fisheries, aquaculture, energy, shipping, and ocean technology, this project is led by Innovasea from Nova Scotia. It will deliver world-class digital technology to monitor fish health, fish movement, and the ocean environment for these diverse sectors.

OCEAN VISION PROJECT (\$18.8 MILLION): Led by Kraken Robotics of St. John's, N.L., this partnership is creating an underwater technology service hub to provide high-resolution images of the sea floor to a variety of ocean industries.

TALLYBOT PROJECT (\$4.5 MILLION): This initiative supports the development of automation and AI machine learning that finds solutions

to help modernize seafood processing in terms of traceability, quality, and efficiency. The partnership is led by ThisFish Inc., a B.C. company.

ECOSYSTEM DEVELOPMENT: The Ocean Supercluster supports training, mentorship, and resources for the ocean economy, benefiting more than 4,000 Canadians. Initiatives and projects have helped mid-career Indigenous people into careers in oceans and 40 start-ups in oceans (of which 14 are close to revenue generation), as well as the growth of more diverse teams of talent by engaging communities of under-represented groups in Canada.

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