

Agents and assets: Understanding the local context for digital opportunities in Canada

Summary of Theme II Research Findings and Policy Implications¹

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1 Introduction

As Canada and its cities face the emergence and evolution of new and potentially disruptive technologies, it is important to understand how firms in Canadian cities benefit from their location in particular local and regional innovation and entrepreneurial ecosystems. While the pursuit of talent, capital and markets for firms in the digital space may be global in scope, the received wisdom is that these activities are best supported when firms themselves are deeply embedded in local and regional innovation and entrepreneurial ecosystems. Firms benefit from close proximity to suppliers, customers and competitors, as well as the activities of universities and colleges, other research institutions and think tanks, industry associations, innovation intermediaries (including accelerators and business incubators), the presence of investor and mentor networks, and various government policies and programs. They can also exploit other unique place-based advantages, including access to deep labour markets and specialized skills.

The Creating Digital Opportunities (CDO) research partnership explored **how local context matters** to the evolution of the digital economy across Canada and **how local context underpins and embeds digital opportunities** in particular places. The project pinpointed specific local characteristics that were consistently important to creating and sustaining digital opportunities in Canadian cities, as well identifying important interventions that grounded success.

Overall, this collective body of in-depth research is unequivocal about the importance of **local agents**, such as flagship firms, business and civic leaders, entrepreneurs, and associative actors that play key roles in anchoring digital industries. Furthermore, **local assets**, including universities and colleges, private and public research institutions, pools of highly skilled and talented workers, unique place characteristics, and the quality of the built environment provide the foundational social and knowledge infrastructure that support the development of digital opportunities.

The remainder of the report is structured as follows. First, the report begins with an overview of CDO's research on the local context for global production networks. Second, the report identifies and delves into key crosscutting themes that emerge across the different research studies. Finally, the report concludes by offering emerging lessons and insights for business and civic leaders, public policymakers and practitioners.

2 The local context for global production networks

Over the course of the CDO project, researchers completed a series of place-based case studies in major urban centres with a strong tech presence across Canada: Toronto, Vancouver, Montreal, Waterloo, and Ottawa. In addition to these detailed case studies of ICT and related digital and technology-oriented activities

¹ The authors are grateful for the insights generated by the large team of CDO researchers, post-doctoral fellows and students who have spent the past five years conducting high-quality and careful research across Canada. All errors and omissions remain the responsibility of the authors.

in Canadian cities, researchers working under the auspices of Theme II conducted several studies focused on intermediaries and digital platforms that act as brokers in the innovation process, broadly defined.

Researchers used a mix of quantitative and qualitative methods to pull together insights into how Canada's digital opportunity is taking hold in various geographic contexts and shaped by local, provincial and national public policy, as well as local private, public and civic leaders and organizations. Insights are derived from over 350 in-depth interviews with firms, industry experts, policy leaders and other key actors; quantitative data collected via surveys, online digital platforms, and other proprietary sources; and a review of policy documents, industry reports and other secondary materials. Indeed, the use of novel data sets derived from digital platforms, as done in two of the studies¹, in itself presents a digital opportunity for conducting research and generating evidence-based policy insights.

In this section, we provide a brief synopsis and overview of each of the studies conducted under the auspices of the Theme II: The Local Context for Global Production Networks.

2.1 Digital resilience in Ottawa: Luck, legacy and local leadership²

Ottawa has had a longstanding global presence in the ICT sector. The CDO study of Ottawa interrogated how Ottawa's digital economy has remained globally relevant during a period of technological change and the demise of one of Canada's leading technology firms, Nortel. Today, Ottawa's the digital sector has world class capabilities in Software Defined Networking (SDN), a critical underlying technology that supports the demands generated by cloud computing applications, large data centres, and fifth generation wireless technologies (5G). Because of this concentration of specialized expertise, all of the largest global technology players have established a local research presence, including Nokia, Ericsson, Huawei, Juniper Networks, Cisco Systems, alongside existing Canadian firms, QNX (Blackberry) and Mitel.

CDO's research reveals that these foreign investments and location decisions were made possible due to the legacy of Nortel, which itself has roots in federal research labs operated by the National Research Council. Over a sustained period of time and with government support through programs like the SR&ED, Nortel developed expertise related to SDN. In the wake of Nortel's closure, global firms were quick to acquire Nortel's R&D talent, patent holdings, and business units related to SDN.

Public investments and support were also critical in securing these multinationals, both directly, through provincial subsidies, and indirectly, through the actions of local leaders. A series of local initiatives, including the Centre of Excellence for Next Generation Networks (CENGN) and Wesley Clover, L-Spark and Alacrity, have created further opportunities for local firms and have facilitated collaboration amongst the multinational firms, embedding them within the innovation ecosystem and the region. Overall, the study emphasizes the important (and sometimes hidden) role that government plays in supporting, upgrading and maintaining the dynamism of local innovation systems.

2.2 Digital industries in Montreal: Building a local common³

In Montreal, researchers explored the local dynamics of digital eco-systems. They examined the economic, technological and societal factors driving the creation of innovative and competitive digital ecosystems, as well as evaluating the extent to which policy measures can influence the sustained ability of cities and region to attract and generate talent, capital and knowledge. The study focused on the case of the video game industry in Montreal, where there is an intricate interplay between formal actors (firms, research institutions, etc.) and informal actors and spaces (diverse communities, collectives, geek cultures, etc.). The study finds that firms and other formal institutions feed into and benefit from the creation and maintenance of common goods, including a collective commons where experimentation, random encounters and other interactions facilitates the high levels of innovation and creativity necessary for success in the for-profit video game

industry. These local commons are the product – directly and indirectly – of long-term investment and participation by formal private sector companies, informal groups and public authorities.

2.3 Entrepreneurs and the evolution of Toronto’s ICT cluster⁴

In Toronto, researchers focused on the factors fuelling the emergence of Toronto’s local start-up scene and the transformation of its ICT cluster. Through extensive interview work, the researchers provide evidence that serial entrepreneurs in particular have been responsible for re-deploying financial and knowledge capital into the local entrepreneurial ecosystem. Moreover, there has been a rapid expansion in the number of local innovation intermediaries, including business incubators and accelerators, which provide the necessary supports for new venture creation, removing some of the more traditional barriers to entry. Simultaneous with the growth of a more supportive associative structure, there has been profound technological changes, especially associated with cloud computing. Global cloud service providers deliver critical services that reduce costs and present opportunities related to technology and business development for new entrants. Local firms stressed the importance of a deep local talent pool generated by the large number of leading publicly-funded post-secondary institutions in the region, as well as the activities of local associative actors such as TechToronto and Barcamp, which develop networks amongst highly skilled and talented workers. It was clear that there was an important role for government both directly through operating programs that allow firms to reach overseas markets, access research tax credits (e.g. SR&ED) and other funding (e.g. IRAP), as well as indirectly, through their support of civic capital-building organizations.

2.4 Digital industries in Vancouver⁵

In Vancouver, researchers sustained a study examining the digital industries. While the most well-known digital activities in Vancouver relate to visual effects, animation and games (VFX), where it has established a strong reputation, researchers quickly discovered that digital activities pervade most sectors of the regional economy. For the most part, Vancouver’s digital activities centre on software development in the service of a broad swath of industries, with talent being developed locally by public universities, colleges and other research institutions. Researchers uncovered the movement of US-based multinationals to Vancouver, in part as a response to shifts in US immigration policies, as well as the relative costs of doing business. And a number of large technology firms, including Amazon and Electronic Arts, have a large presence in the city-region. And while Vancouver has many desirable quality of place characteristics that attract both firms and talent, Vancouver faces the challenges seen in other new economy cities, especially related to housing affordability and the precariousness of digital work, increasing viewed as ‘gig economy’ work.

2.5 The fate of flagships: Anchor firms in Canada’s Technology Triangle⁶

CDO researchers assessed various aspects of the well-storied case of Canada’s Technology Triangle, centred around the Kitchener-Waterloo region in southern Ontario. Previous accounts by members of the CDO research team have emphasized the importance of local universities, industry associations, regional culture, path dependence and industrial history to the region’s resilience and dynamism over time.⁷ Yet, these alone may not explain why this modest, mid-sized manufacturing community has become a dynamic centre for tech-based entrepreneurship and ICT activities, ranking globally for its start-up activities.⁸ In this more recent research, CDO researchers challenged us to consider why this region has had success and raises questions about the dominant narrative regarding the role of the region’s major employer, Blackberry (formerly Research In Motion) in anchoring the region’s dynamic ICT cluster and its more contemporary role in the entrepreneurial and innovation ecosystem.

CDO researchers asked whether or not there was an opportunity for Canadian regions to learn from their Nordic counterparts. Through such comparisons, it is possible to hone in on the distinctive quality of place

characteristics that allow for the success and dynamism of these smaller centres, even in the face of a major employer downsizing and restructuring. Here, the comparison of Blackberry and Waterloo against the Nordic case of Nokia and Oulu, Finland is productive and useful. In each case, these regions were home to the headquarters of late entrants to the mobile phone market and each has maintained a sustained global reputation as a technology hub despite their small and somewhat peripheral locations. The evidence strongly suggests that tight-knit social networks allow for new business models to diffuse across the region, firm learning about how to do business, and the construction of a strong, collective identity and narrative about the position of the region in the global digital economy. Over a long period, local actors have leveraged this narrative to attract talent (especially students), capital and public investments.

This strong narrative posits a challenge in trying to uncover answers to questions such as what *really* happened when the largest tech-based employer in town fails. In a second study of the region, researchers examined what happened to the technical talent at Blackberry as this major global player underwent restructuring and downsizing after it did not adapt to changing market conditions brought on by new entrants such as Apple into the mobile telephony market. Blackberry's demise, most strikingly observed in the plummeting of its stock prices and substantive layoffs, raised questions for local and national leaders about the fate of Canada's technology sector and one of its most important technology regions. Initial concerns centred on whether or not highly qualified talent would leave and go to other tech centres, namely Silicon Valley. Later, local narratives rested on the region's resilience and ability to overcome these challenges and that Blackberry workers were instrumental in starting new local firms in the entrepreneurial ecosystem. Researchers leveraged novel digital data from on-line career platforms to evaluate the aftermath of Blackberry's demise. They found that while some technical talent did, in fact, leave, there was by no means a mass exodus and, over time, more technical talent remained in the region. Moreover, this technical talent was not particularly entrepreneurial, with minimal new venture creation. However, over time, local start-ups began to hire this technical talent, this embedding these former Blackberry workers in the entrepreneurial ecosystem. Researchers pin the increasing ability of the region to retain talent and redeploy it to local start-ups on the activities of local associative actors, especially Communitech, the local government-supported industry association that plays a key coordinating role in the region.

2.6 Digital platforms and innovation intermediaries

Finally, several studies sought to understand the role of intermediaries, as agents or brokers connecting together different actors involved in the innovation process, including research, funding, or business and product development. The first study examined the role and impact of ICT research intermediaries on Quebec's innovation ecosystem.⁹ Through developing in-depth case studies of four research intermediaries, researchers explored capacity of these organizations to establish and maintain networks, their mode of operation, their IP management strategies, and their ability to develop intra- and extra-sectoral relationships with researchers and research institutes, firms and community partners both locally and internationally. The study found that a lack of coordination introduced challenges to firms in navigating the complex landscape of innovation intermediaries.

The second study also focused on innovation intermediaries¹⁰, with an explicit focus on the Canadian Acceleration and Innovation Program (CAIP) that provides support for new ventures through the so-called innovation 'valley of death' in venture financing. The research traces how innovation support organizations have evolved from campus-based technology transfer offices (TTOs) to research parks to business incubators that provide entrepreneurial business support services and most recently to accelerator programs that provide short-term and targeted support to innovative and promising start-up firms with the potential for revenue and employment growth. The research reviewed evidence on how these innovation intermediaries connected firms to global innovation networks, value chains and customers, as well as exploring the role of public

financial support for the start-up and scale-up firms participating in business incubators and accelerators. The research finds that the most successful innovation intermediaries were those that had stronger and broader networks to connect nascent firms with mentors, larger firms, investors, international partners and other potential stakeholders.

A final study focused on how digital platforms have created new mechanisms for raising capital, acting as a digital intermediary connecting entrepreneurs and funders.¹¹ Given the potential for entrepreneurs, their projects, and their supporters to be located anywhere, this raises the question as to how spatially concentrated, or clustered, these activities will be. The researchers focused on the use of the crowdfunding platform, Kikstarter, used by entrepreneurs to generate financial backing for digital media (e.g. games, design, music) and local projects (e.g. food trucks, community gardens) in Canada and elsewhere. They found that while projects were generally only weakly clustered, those that were able to recruit funders were more greatly clustered in particular locations. Interestingly, digital media projects were more strongly clustered than local projects, even after controlling for socio-economic and demographic factors. This reinforces the idea that, in the realm of cultural production, place still matters to the location of this type of activity. Moreover, entrepreneurs using these platforms to raise funds were better able to do so, if they linked their funding campaigns to other forms of digital media, especially professional websites rather than social media, as a means to signal legitimacy to potential backers.

3 Agents and assets in the local economy

What can this suite of in-depth and rigorous studies tell us about the local context for global production networks in Canada's digital age? **Our studies consistently identified a series of agents and assets that supported the digital economy.** First, large anchor or global firms were identified as important agents in local digital ecosystems. Second, a range of associative actors and other local agents were critical, including serial entrepreneurs, business and civic leaders, investors, as well as associations and intermediaries, provide opportunities, knowledge and strategic leadership. These agents develop pipelines to knowledge, talent, capital, markets and other resources locally and elsewhere. They also develop and support networks for mentorship, knowledge exchange, and learning amongst firms and others actors involved in digital industries. Finally, local **assets**, including both tangible and intangible resources, provide foundational infrastructure for the digital economy to develop and thrive across Canada. These assets include a strong base of highly skilled and qualified talent, research and knowledge infrastructure, including universities and corporate research laboratories, as well as unique place-based characteristics. Each of these is discussed in detail below.

3.1 The presence of anchor or global firms

As noted, the case studies revealed the critical role that large, often foreign-owned, firms can play in anchoring digital opportunities in places with high concentrations of digital activity. In general, the view of both large Canadian or foreign-owned technology firms is that their presence in local innovation and entrepreneurial ecosystems results in positive outcomes. Large anchor firms provide employment opportunities that are important training grounds for technical talent, They also provide reputational effects, communicating signals to other firms regarding the high quality of the local environment, and they often act as customers, partners or investors for smaller and start-up firms in the local economy. Finally, these large firms can – either independently or in partnership with and leadership from local associations – invest in and develop the local ecosystem, thus ensuring its longer-term dynamism.

For example, in Waterloo, Blackberry was important for placing Waterloo on the map as a key global technology player. The founders of Blackberry were also instrumental in the founding and supporting of one of the most important local organizations in the region today: Communitech. The founders also reinvested in the region, providing funding for the development of research institutes focused on leading basic and applied

research. In parallel with its demise, a number of other larger global companies, such as Google and Square, have entered the region. Moreover, even large Canadian companies in other sectors have found a way to maintain a presence in the region through Communitech's corporate partner programming that allows these firms to operate labs onsite, thus connecting local start-ups with potential large Canadian customers.

Large Canadian- and foreign-owned multinational enterprises have also played a longstanding role in anchoring Ottawa's technology sector. For decades, Nortel played this role and with its demise, the major global players have established a research presence. Notably, Nortel and the newer offices of multinationals, have all benefited from strong government support, including through provincial subsidies for many of the latest firms to locate in the region, with promises of employment opportunities for highly qualified and skilled Canadian talent.

This is also true in Montreal, where generous provincial tax programs supported Ubisoft's expansion into North America. Ubisoft has been instrumental in supporting many of the features described above as part of the local common, or middleground. Since arriving in Montreal in the late 1990s, Ubisoft has actively tried to connect to its local environment and has been a key agent in developing the broader ecosystem within which it is embedded. This has included organizing events, prize-winning contests, local training programs, as well as actively encouraging its talent to participate within the local cultural scene.

Similarly, in Vancouver, Electronic Arts and Microsoft, and - more recently – Amazon and Sony all have a strong presence in the region. And in Toronto, IBM has played an important anchoring role even as the cluster evolves to provide a more dynamic environment for start-up and scale-up firms. Notably, with the exception of Blackberry and Mitel, there are few large Canadian firms that are global players.

3.2 Associative actors and innovation intermediaries

While these large global firms often anchor employment and research activities in their respective locations, it is other actors in the region that often provide important supports that embed these large MNEs in local innovation ecosystems, as well as support SMEs and a constellation of start-up and scale-up firms. The research consistently identified a large suite of local actors that help to build and support to the local ecosystem, as well as provide opportunities for firm learning, knowledge exchange, networking and skills development.

For example, in Ottawa, two locally led strategic initiatives (CENGN and Wesley Clover) accessed public resources, revealing the way in which governments have indirectly supported this strategic approach to economic development. CENGN was enabled by the federal government Network of Centres of Excellence program, and Wesley Clover partnered with Invest Ottawa to create L-Spark through the Canada Accelerator and Incubator Program. These two organizations have played critical roles in enabling partnerships between local firms, further embedding the larger global players into the regional economy.

Associative actors playing similar roles exist in Toronto (Tech Toronto), Waterloo (Communitech) and Montreal (IGDA), alongside industry associations, accelerators, business incubators and other intermediaries. Collectively, these organizations contribute to developing mentor networks, providing local networking opportunities, matchmaking (between firms, firms and workers, firms and funders), enhancing global connectivity through providing access to markets, capital, and networks, and enhancing the local talent pool. For example, Communitech helps to build and support local networks of business leaders, entrepreneurs and highly skilled technical and managerial talent. Through their collective leadership and coordinating activities, these local actors actively shape and direct the development of the local innovation and entrepreneurial ecosystem.

3.3 Local assets and unique place-based characteristics

Finally, the collective wisdom gleaned from these studies is unequivocal about the importance of local assets and unique place-based characteristics that ground ICT and digital economy activity in particular places. These collective resources and shared assets that benefit the ecosystem as a whole. Consistently, the quality of the skills and qualifications embedded within local and regional labour markets was identified as a critical local asset. Universities and colleges contribute to developing these deep pools of specialized talent, including through tailored programming that meets specific local industry needs. These institutions, along with other research institutes, often work in partnership with industry and community, both to produce important leading edge scientific discoveries, as well as applied research that addresses economic, social and environmental concerns.

Beyond the presence of specialized knowledge infrastructure, other unique, place-based characteristics matter to attracting and retaining this talent pool, as well as providing the appropriate environment for digital firms to thrive. This includes maintaining affordable housing; strong inter- and intra-regional transportation networks, including transit; and a high quality built environment. As noted especially in Montreal and Vancouver where a high proportion of digital activity relates to cultural production, the presence of common local assets (a middleground) provide important collective infrastructure for learning and knowledge exchange. Thus, it is imperative to preserve authentic spaces, but not for reasons popularized by urban thinkers such as Richard Florida, but because rather these neighbourhoods offer productive spaces for encounter and learning, setting norms, and building a local commons.

4 Challenges and policy lessons

Overall, CDO's research on the local context of global production networks provides a rich tapestry and understanding of the state of ICT and related digital activity across Canada, especially in the centres with the highest concentrations of firms, employment, investment and related activity. However, it is no accident that tech-based and digital activities are embedded in these places. As this research has made clear, local factors are important in determining the nature and location of the digital economy. Building from the empirical insights gleaned from this research, the CDO project identifies a number of challenges observed across the studies and offers a number of policy lessons.

Undoubtedly the digital age brings great opportunities for firms, cities and communities across Canada. However, there are some challenges. First, firms identified issues related to **IP policy**, especially in the digital sector. Alongside these issues, are issues related to the enforcement of IP rights. Second, funding and financing issues are a challenge for digital firms of all sizes and across the various niches in the digital sector. In some instances, government funding is for entrepreneurs and scale-up firm issues related to **financing and access to capital** continue to prevail. Firms have challenges accessing debt financing and VC capital has been historically difficult to access, especially patient capital rather than private equity. While the availability of more start-up capital and interest from US investors with private equity has increased, especially since 2008, this may be leading to early exits and foreign acquisition. This latter point is doubly problematic due to the **challenges associated with the scale-up of domestic digital firms and the minimal number of Canadian-owned global players in digital industries**. This issue continues to be a challenge across Canada.

As discussed, a large number of associations and intermediaries have emerged that attempt to redress some of these issues. For example, emerging digital platforms, like Kikstarter in the case of digital media, might offer alternative avenues of financing are layering onto the existing financing landscape. At this time, these appear to reinforce existing locational patterns rather than create opportunities in new places. In other parts of the digital economy, industry association and intermediaries help deliver local programming to assist firms with

starting and scaling up. However, as noted in the two CDO studies explicitly focused on innovation intermediaries, **the intermediary landscape is crowded, uncoordinated, and difficult for firms to navigate.**

Increasingly, **digital work can be precarious.** This was observed most acutely in Montreal and Vancouver, where digital work is often oriented towards projects and more culturally-oriented. These risks are felt unevenly across the labour market and are a source of digital exclusion. Moreover, the concentration of digital opportunities within a small number of Canadian cities has been accompanied by other potential downsides. Most striking are those associated with **rising inequality and housing costs**, observed in Toronto and Vancouver, but also in smaller centres such as Kitchener-Waterloo. A particular challenge associated with the growth of digital industries are upward pressures on housing prices, leading to affordability challenges across the spectrum. At risk in a tech-centric approach to economic development is the potential for broad-based prosperity and inclusion, without appropriate public policy interventions or attention to these issues.

The collective body of evidence generated by the CDO project underscores the **critical importance of public investment and support, in parallel with private sector investment and activity.** This is consistent across every single study conducted under this research theme. Public investments in higher education and research are of fundamental value: the quality of the local environment and its associated talent pool are very much a product of high quality, publicly funded universities and colleges. Public research institutions are also critical. At the federal level, funding through the National Research Council (NRC), the National Science and Engineering Research Council (NSERC), MITACS, as well as important tax credits, such as the SR&ED program, are critical ingredients in underpinning the most dynamic local and regional innovation ecosystems.

However, the evidence is also clear that the **public and private supports for innovation in a digital age reach well beyond traditional investments and support for R&D** in firms, laboratories, universities and other research institutions. Unquestionably, there is a role for a wide range of formal intermediary organizations, usually organized at the local level. These organizations play a critical coordinating role within the local economy and are often best placed to identify collective strengths and challenges. At their best, these organizations act as regional stewards, convene local actors and provide long-term strategic guidance. Beyond these formal intermediaries, the studies speak to the importance of investing in city building and the preservation of authentic spaces in the city. In other words, **to thrive in the digital age, Canadian cities and communities must develop and take advantage of unique local assets.**

While there is no question that digital activities are at the heart of Canada's next economy, there are some necessary words of **caution against replication.** For example, the ability of policymakers, business and civic leaders and other organizations to replicate in full the success of regions such as Ottawa or Waterloo, which have maintained resiliency in the face of economic shocks and the demise of major tech employers, may be quite limited. In these cases, there are long histories of public and private investment, layered upon firm and policy decisions, and strategic actions that align local firm capabilities with the assets of the local environment. In other words, the lessons here are not so much about copying specific local actions, but rather in understanding that places that thrive in the digital economy do so because they have been able to **build on their unique local assets and strengths to construct regional advantage, strategically and collectively.**

5 Endnotes

¹ Breznitz, S. and D. Noonan. *The Digital Media Industry in Canada through Crowdfunding*. CDO Working Paper; Vinodrai, T. and Spigel, B. 2019. *Anchor firm disrupted*. CDO Working Paper.

² Creutzberg, T, Haley, B. and Julie, T. 2019. *Luck, legacy and local leadership: Transitioning to New Digital Opportunities in Ottawa*. CDO Working Paper.

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⁴ Denney, S., T. Southin and D.A. Wolfe. 2019. *Entrepreneurs and the evolution of Toronto's ICT cluster: Insights and lessons learned*. CDO Working Paper.

⁵ Holbrook, A. 2019. *CDO in Vancouver*. CDO Working Paper.

⁶ Vinodrai, T. and Spigel, B. 2019. *Anchor firm disrupted*. Working Paper; Ornston, D. 2018. *When flagships falter: Comparing BlackBerry and Nokia*. Presentation at the CDO Annual Meeting, Vancouver.

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¹¹ Breznitz, S. and D. Noonan. *The Digital Media Industry in Canada through Crowdfunding*. CDO Working Paper