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INCUBATING ENTREPRENEURIAL ECOSYSTEMS: REGIONAL INNOVATION CENTRES AND CIVIC CAPITAL IN OTTAWA, TORONTO, AND WATERLOO

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Abstract

A growing literature argues that entrepreneurial ecosystems benefit from intermediary organizations which increase civic capital or connectivity among entrepreneurs, risk capital, knowledge-bearing institutions, sophisticated customers, and complementary service providers. These intermediary organizations, however, are seldom subjected to comparative analysis. Focusing on three regional innovation centres in Waterloo (Communitech), Toronto (MaRS), and Ottawa (OCRI, now Invest Ottawa), we find that all three organizations fostered greater connectivity within their communities, but that they did so in very different ways. Distinguishing among entrepreneur-led "community creators," institution-led "buzz builders," and anchor-led "cluster organizers," we demonstrate how institutional origins and organizational design shape their programming choices and, by extension, the structure of civic capital. While the differences among Communitech, MaRS, and Invest Ottawa have narrowed over time, this analysis suggests that organizations seeking to improve connectivity in immature, entrepreneurial ecosystems face important tradeoffs.

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While rapid technological changes such as the rise of the Internet, mobile devices, and cloud computing are perceived to have concentrated capital within a handful of superstar firms and regions (Bessen, 2018; Florida, 2018; Kemeny and Storper, 2020), a number of Canadian cities have successfully navigated these disruptive developments, relying on civic capital to connect Canadian-owned technology firms to risk capital, knowledge-bearing institutions, sophisticated customers, and complementary service providers (Cohendet et al., 2018; Haley et al., 2017; Denney et al., 2021; Ornston, 2021; Bramwell and Wolfe, 2008). They have done so in very different ways, with Toronto relying on weak ties to scale high-technology enterprises in a wide variety of different industries, Ottawa using deep cooperation in research and education to mobilize resources around a limited number of verticals, and Waterloo supporting an array of smaller firms in diverse, business-to-business niches with peer-to-peer mentoring networks (Creutzberg et al., 2023).

This paper seeks to explain why these three entrepreneurial ecosystems developed different forms of civic capital and, by extension different high-technology footprints. We do so by focusing on regional innovation intermediaries or the glue which connects entrepreneurs to one another and the broader array of resources which define an entrepreneurial ecosystem (Hernández-Chea et al., 2021; Spigel, 2018). Examining leading the "regional innovation centres" (RICs) in Waterloo (Communitech), Toronto (MaRS) and Ottawa (OCRI, now Invest Ottawa), we find that all three played a constructive role in fostering connectivity, investing in public goods, and building a common identity. These RICs did so, however, in distinct ways which reflect their unique origins and organizational structure. Communitech in Waterloo, which was established and remains governed by local entrepreneurs, created a strong peer-to-peer mentoring network to nurture local startups, but until recently struggled to foster deeper, patterns

of cooperation, narrow its mandate, or scale enterprises. The MaRS Discovery District (MaRS) in Toronto, which was founded by private and non-for-profit institutional actors, could use its resources and flexible governance structure to support scaleups in specific verticals, but has proven less accessible to smaller startups. The Ottawa Carleton Research Institute (OCRI), anchored by large, incumbent technology firms, supported specialized cooperation in research and education. This deep, specialized knowledge created scaling opportunities, but technological specialization and its reliance on large corporate partners narrowed regional comparative advantage and increased regional vulnerability to disruptive technological change.

Distinguishing among entrepreneur-led "community creators" (Communitech), institution-led "buzz builders" (MaRS), and anchor-led "cluster organizers" (OCRI) enables us to make four contributions to the literature. First, we shed light on why high-technology communities in Ontario have evolved in different ways. Second, and more broadly, we answer calls to study how entrepreneurial ecosystems emerge (Cavallo et al., 2019; Hernández-Chea et al., 2021; Wurth et al., 2022), demonstrating how the organization of innovation intermediaries shapes regional high-technology competition and proposing a tripartite typology which merits further study. In doing so, we advance emerging work on regional variation in "civic capital" (Creutzberg et al., 2023; Nelles and Wolfe, 2022; Spigel, 2013; Spigel, 2017a) by explaining *why* social connectivity varies across regions. Finally, our work has important implications for policymakers (Breznitz, 2007; Evans, 1995; Indergaard, 2019; O'Riain, 2004) seeking to incubate entrepreneurial ecosystems. Here, we illustrate how a government's choice of partners simultaneously enables and constrains high-technology entrepreneurship. We conclude the essay by commenting on how our three RICs, Communitech, MaRS, and Invest Ottawa, have worked

to soften these tradeoffs as well as any remaining, national-level barriers to high-technology entrepreneurship in Canada.

Regional Innovation Centres and Entrepreneurial Ecosystem Incubation

Recent years have witnessed growing interest in high-technology entrepreneurship as a response to the disruptive pace of technological change (Jung et al., 2017; Hernández-Chea et al., 2021; Indergaard, 2019). Historically dominated by incumbent producers in large, wealthy countries (Dalum, 1988; Kristensen and Levinsen, 1983) and concentrated in a handful of regions (Glaeser and Ponzetto, 2010; Rodríguez-Pose, 2018), the rise of new information and communication technologies and the fragmentation of production into global value chains (Zysman, 2006) have created new opportunities for smaller companies in high-technology laggards to enter digital markets (Breznitz, 2007; Hajela and Akbar, 2013; Storper, 2011). In contrast to traditional industrial clusters or "business ecosystems" (Porter, 1990; Moore, 1993), "entrepreneurial ecosystems," characterized by the routinized creation of new, high-productivity firms, do not require a capacious state, a globally dominant flagship firm, or large-scale investment by multinational enterprises (Wurth et al., 2022).

Yet the prerequisites to entrepreneurial ecosystem creation remain formidable. While less capital-intensive than the high-technology industries of yesteryear (Kristensen and Levinsen, 1983), high-technology entrepreneurship nonetheless requires access to risk capital, knowledge-bearing institutions, human capital, incubators, accelerators, or similar co-working space, and a dizzying array of complementary service providers (Wurth et al., 2022; Leendertse et al., 2021; Mason and Brown, 2014). Moreover, although less tightly integrated than traditional industrial clusters, an entrepreneurial *ecosystem* is defined by the ability to connect these different actors

and resources (Spigel, 2016). Comparative studies suggest that high-technology entrepreneurial ecosystems, particularly nascent ones, require a "collective identity," "civic capital," or similar connective tissue to capitalize on their advantages (Creutzberg et al., 2023; Nelles, 2013; Nelles and Wolfe, 2022; Storper et al., 2015; Wolfe, 2012).

Although recent literature has documented the importance of civic capital for high-technology entrepreneurship (Safford, 2009; Storper et al., 2015; Nelles and Wolfe, 2022), the process by which regions create this civic capital is less well developed (Asheim et al., 2016). This is particularly true of comparative work, including research on Canada, which recognizes that the character of civic capital varies across entrepreneurial ecosystems (Creutzberg et al., 2023; Spigel, 2013; Spigel, 2017b), but does not explain these differences. To generate greater insight into the origins and variation in civic capital among emerging entrepreneurial ecosystems, we turn to the concept of intermediary or anchor organizations from the literature on entrepreneurial ecosystems. Identified as important catalysts in ecosystem formation, (Powell et al., 2012; Stam, 2015; Hernández-Chea et al., 2021; Cao and Shi, 2021; Spigel et al., 2023). These intermediaries can take many different forms, from anchor firms (Harrison et al., 2004) and university research parks (McCarthy et al., 2018) to venture capitalists (Powell et al., 2012), accelerators (Breznitz and Zhang, 2019), and public agencies (Indergaard, 2019).

In this paper, we focus on provincially designed "regional innovation centres" as the leading intermediary organizations within their respective entrepreneurial ecosystems. In light of the attention already paid to specialized service providers (Breznitz and Zhang, 2019; Clayton et al., 2018; Ornston and Camargo, 2022; Pauwels et al., 2016), which deliver direct supports such as courses, capital, technology assistance, and laboratory space, we focus on the way in which RICs increase connectivity within the broader ecosystem. They do so in three ways, fostering

interaction within and beyond the entrepreneurial community (McCarthy et al., 2018), using narratives and symbols to develop a common identity (Ornston, 2021), and brokering investment in public goods (Creutzberg et al., 2023). Despite their potential importance to entrepreneurial ecosystem formation (Hernández-Chea et al., 2021), the role of these system-level integrators remains understudied. We argue that this is an important omission as recent research on other entrepreneurial support organizations, including accelerators (Breznitz and Zhang, 2019) and research parks (McCarthy et al., 2018), suggests significant differences in structure and strategy. We hypothesize that RICs also vary.

To test this claim, we examine three leading entrepreneurial ecosystem incubators in Ontario, Canada, Communitech in Waterloo, the MaRS (originally Medical and Related Sciences) Discovery District in Toronto, and the Ottawa-Carleton Research Institute (OCRI, renamed the Ottawa Centre for Research and Innovation and then Invest Ottawa).[1] Consistent with the literature on entrepreneurial ecosystems, we find that all three RICs supported ecosystem development by connecting firms with one another and complementary service providers, developing a common identity or regional brand, and supporting investment in collective goods. These similarities, however, obscure important differences. Although all three organizations engaged multiple regional stakeholders within their corporate board, Communitech was established and remains governed by entrepreneurs, MaRS has been dominated by representatives from traditional industry and civil society, and OCRI was spearheaded by large,

[1] Consistent with the literature on entrepreneurial ecosystems and its focus on non-state leadership (Spigel 2011), none of Ontario's three leading EEIs were founded by local governments. We briefly discuss how a municipal takeover transformed "Invest Ottawa" in the 2000s and 2010s. A detailed discussion of this state-led EEI, its strengths, and weaknesses is beyond the scope of this paper, not least because it more closely resembles a regional development agency in its governance and mandate.

incumbent, technology firms. We argue that these differences mattered, shaping both RIC activity and local network formation in ways that could impact entrepreneurial activity.

We characterize Communitech as a "community creator" for its central role in bridging Waterloo-based entrepreneurs and creating a brand around the local tech community. Communitech's proximity and accountability to the local entrepreneurial community improved its accessibility, enabling it to deliver broad-based public goods which benefited all startups, including smaller, less influential firms. The marginal position of these founders within the local and national community, however, limited the organization's access to resources, particularly in earlier years. Indeed, we find that this "community creator" has specialized in the provision of peer-to-peer mentoring networks. This less capital-intensive programming supported robust startup activity, but until recently limited the sector-specific expertise and deeper cooperation that could have supported scaling.

By contrast, the early involvement of large, institutional actors in MaRS enabled the organization to attract capital and connections. As a result, this cross-sectoral "buzz builder" (Storper and Venables, 2004) developed more extensive and expensive programming and had an easier time forging connections to complementary industries. MaRS' independence from the local entrepreneurial community, however, limited its relevance for younger firms. In fact, while some larger firms spoke favorably about the organization, many younger, smaller enterprises found its support narrow in scope or inaccessible, eschewing MaRS for other regional innovation centres.

Finally, OCRI was organized by leading local technology firms in partnership with three academic institutions, Carleton University, the University of Ottawa, and Algonquin College.[2]

[2] While some suggest that these universities played a leading role within OCRI, organizational veterans suggest that large, technology firms were the dominant actors until the 2000s (interviews O2 and O19).

This industry-led organization was in a stronger position to attract resources than its entrepreneur-led counterpart, Communitech, but cooperation revolved around commercially applicable research and commercialization rather than peer-to-peer mentoring. The resulting "cluster organizer" enabled smaller startups to leverage deep, specialized knowledge and within-industry supply chains in the 1990s, but deficits in other areas such as commercialization disadvantaged smaller firms in other niches. When its industrial champions collapsed, this cluster organizer, and technology sector more generally, faltered (Ornston and Camargo, 2022). Table 1 summarizes these differences.

Table 1: The Entrepreneurial Ecosystem Incubators Compared

	Communitech: Community creator	**MaRS: Cross-sectoral buzz builder**	**OCRI: Cluster organizer**
Founding Actors	Local high-technology entrepreneurs	Large, non-technology firms and civic leaders	Large incumbent technology firms
Partners	Regional universities, local government	The University of Toronto, local and global industry	Regional universities, federal research labs, and local government
Founding Date	1998 (preceded by the Atlas Group)	2001	1983 (government takeover in 2001, redubbed Invest Ottawa in 2013)
Connectivity	Dense ties within the local entrepreneurial community, partnerships with local universities and government, weak links to non-technology industry	Strong connectivity to leading firms both locally and internationally, as well as veteran entrepreneurs, weak internal connectivity among startups	Strong linkages within the telecommunications industry, connecting leading firms, startups, and complementary service providers. Weak connections outside of it
Common identity	Cultivated a strong, regional identity based on high-tech competition and self-help networks	Built around MaRS' own reputation for excellence rather than a regional or sector-specific identity	Promoted a regional identity of Ottawa as a "telco town"
Collective goods	Founders suggest that the most valuable resource was peer-to-peer mentoring networks	Used access to resources to deliver specialized programming, e.g. market research, coaching, direct capital investments	Brokered specialized training programs, R&D consortia, and infrastructure. Limited entrepreneurial support
Strengths and weaknesses	Self-help networks supported a robust startup scene, but struggled to specialize within advance verticals or scale new firms	Delivered resources to scaling enterprises in a range of industries, but organization was fragmented and less accessible or relevant for younger firms	Created lucrative opportunities for new firms to enter the telecommunications industry, but struggled to foster entrepreneurship outside of it
Post-2010 developments	Using national and international partnerships to attract resource and improve external connectivity	Increasing entrepreneur representation and attempting to build a stronger, internal sense of community	Learning from local organizations and other RICs to develop entrepreneurial supports in a wider range of industries

We view these heuristic (Eckstein, 1975) or hypothesis-generating (Lijphart, 1971) cases as a theory-building exercise, to be tested against a broader set of cases and potentially situated within a broader typology of innovation intermediaries in future research. That being said, the fact that all three RICs were established with similar mandates, connected a wide range of actors across the entire entrepreneurial ecosystem, influenced one another's programming, and received provincial recognition and support (Bramwell et al., 2019) enables us to address several, obvious alternative explanations such a sharp difference in strategic focus. Like most small-n research designs, of course, we cannot control for all background variables (Seawright and Gerring, 2008, p. 304). We instead derive the greatest analytic leverage from process tracing, using the causal mechanisms above to increase the number of observable and, hence, falsifiable implications from a single case study (Bennett, 2010; Trampusch and Palier, 2016). More specifically, we examine the degree to which RIC governance structures shaped their activities and the way their activities shaped the extent and density of local networks. Finally, while not the focus of this paper and more speculative in nature, we illustrate how these connections could have supported or hindered local entrepreneurship. In doing so, we leverage diversity within each region, juxtaposing local RICs with other organizations (e.g., the University of Waterloo's Velocity program, Tech TO, and Invest Ottawa). These within-region shadow cases, while brief, are consistent with the hypothesized impact of RIC design.

Analysis is based principally on 111 semi-structured interviews conducted between 2015 and 2023 with RIC employees, and others connected to the entrepreneurial ecosystem, including other innovation intermediaries, policymakers, universities, journalists, and entrepreneurs. Interview subjects were selected using secondary literature, newspaper reports, and websites as well as subsequent snowball sampling. To address bias (Tansey, 2007, p. 767), interview data

from RIC employees was triangulated with organizational reports, external evaluations, and interview data from entrepreneurs, including firms which had worked with local RICs and those which had not. Because many interviewees requested anonymity, subjects are identified only by their location, Waterloo (W), Toronto (T), or Ottawa (O). Inspired by a broader, cross-regional, multi-researcher project, findings were informed by independent studies of Ottawa (Creutzberg et al., 2019), Waterloo (Spigel and Vinodrai, 2021), and Toronto (Denney et al., 2021) at a series of five, national workshops.[3]

Waterloo: Entrepreneur-centered Community Creating

Waterloo represents a low-density outlier among high-technology, entrepreneurial ecosystems. Although larger cities are widely perceived to enjoy a comparative advantage in digital markets (Berkes and Gaetani, 2020; Caragliu et al., 2016; Therrien, 2005), high-technology employment growth in Waterloo outstripped larger population centres such as Montreal, Toronto, and Vancouver between 2001 and 2016, fueled by over four hundred startups a year between 2011 and 2016 (Ornston, 2021). The University of Waterloo, a world-class engineering school, was central to the region's transformation, but it did not initially support high-technology entrepreneurship.[4] On the contrary, the university was best known as a feeder program for Microsoft and brain drain was a perennial challenge (interview W47). One interviewee characterized 1990s Waterloo as,

[3] Like this earlier project on digital technologies in Canada, interviews began with an open-ended question about the advantages and disadvantages of operating a high-technology firm in the region (when relevant to the interviewee's expertise). Follow-up questions about RICs and their impact on regional development were posed later to reduce bias.

[4] Even after its "entrepreneurial turn" (Bramwell and Wolfe, 2008; Ornston, 2021), the university functioned principally as an entrepreneurial incubator rather than an entrepreneurial *ecosystem* incubator. In other words, the university nurtured student-led firms through programs such as Velocity, but relied on Communitech to connect the region both internally and externally.

> Essentially a Mennonite farming community. [We] had a wonderfully vibrant farming community and somewhat long in the tooth textile and automotive assembly areas, as well as a fledging mathematics and actuarial area because of the insurance companies. And that was Waterloo (interview W3).

Although faculty had spun off multiple, successful, high-technology enterprises from the University of Waterloo, local entrepreneurs recognized that they operated at a significant disadvantage. As one contemporary described it "We didn't have a lot of local influences …. We recognized that we were all jetting around, all primarily export, all high R&D, and we never really had a forum to talk to other people in our situation" (interview W43). The Atlas Group, an informal discussion club, addressed this deficit. An early member described the organization's function as "exchanging stories with each other, literally learning as we grew" (Pender, 2017), with a rotating host presenting a five to ten-minute story followed by discussion and collective problem-solving (interview W43). Another early member confirmed, "The notion of … Atlas, the key foundation of Communitech, was the peer-to-peer training. We wanted to learn from one another" (interview W47).

Communitech's origins stand in sharp contrast to MaRS and Invest Ottawa. As one founder described it, "We all felt a little isolated in a community that wasn't a tech town" (interview W43). Another remarked,

> A lot of people, maybe not all of them, viewed themselves as a bit of a rebel, the grassroots. We did not see ourselves as the big players. We saw ourselves as the little guys …. I think the importance of that is that Communitech started without government funding… [N]ot six millionaires saving a heritage building, and then trying to figure out what to do with it, but companies, how can we help each other and other companies to build bigger, so it started a very grassroots, company-centric (interview T47).

Inspired by a visit to Ottawa and using OCRI as a model, the organization was formalized as Communitech in 1998 to project those stories internally and externally with a single voice (interviews W3 and W43). Because of its grassroots nature, however, Communitech lacked the initial funding to allocate investments in specialized, sector-specific infrastructure, human capital, or research (Creutzberg et al., 2023). Unlike OCRI, Communitech decided early to focus instead on general collective goods such as mentorship and developing peer-to-peer networks (Ornston, 2021).

This "community creator" would grow over time, eventually assuming a leading position within the business community (Nelles, 2014), but it remained dominated by entrepreneurs both in terms of the structure of its corporate board as well as its internal focus (interview T16).[5] The organization was certainly in no position to integrate the bankers and venture capital firms that shaped associational governance in regions such as Silicon Valley (Storper et al., 2015) or San Diego (Walshok and Shragge, 2014). While the organization enjoyed close ties to local politicians and worked smoothly with both local universities and industry, cross-sectoral ties remained comparatively modest. Unlike MaRS and OCRI, neither local government nor universities were represented on the board of directors and entrepreneurs outnumbered large, incumbent firms.

Although Research in Motion (RIM)'s rise transformed Waterloo into even more of a company town than Ottawa, it did not meaningfully alter this dynamic. Even though the RIM represented 40% of technology sector employment and over half of the ICT industry, a higher share than Nortel (Bagnall, 2019; Spigel, 2011, p. 15), RIM never assumed ownership of Communitech. An "aloof" anchor (Ornston and Camargo, 2022), RIM provided free real estate,

[5] Interestingly, and in contrast to literature on accelerator leadership (Breznitz and Zhang, 2019; Siegel et al., 2004), Iain Klugman, Communitech's CEO for 17 years, was not an entrepreneur.

paid membership dues, and co-sponsored events with Communitech, but did not seek to steer its agenda. A former employee remarked, “When I joined RIM, they weren’t joiners. They weren’t even members of the Chamber of Commerce!” (Interview W24). The establishment of a government relations team did not fundamentally alter this dynamic. A Communitech employee commented, “[RIM was] oblivious to the ecosystem in town and they didn’t want any part of it. They would do things like hackathons and run them in Georgia or New York City and so there was this huge disconnect between RIM and this town” (interview W29).

Accountable to local entrepreneurs, but insulated from traditional industry and RIM, Communitech served a broader swath of the entrepreneurial community than either MaRS or OCRI, even following the establishment of local incubators such as Velocity at the University of Waterloo. For example, Communitech reserved 30% of its funding for new firms and, unlike other RICs, it did not discriminate among different sectors. In contrast to OCRI’s specialized telecommunications infrastructure, Communitech prioritized public goods which benefited the community as a whole. Among those goods, entrepreneurs appeared to value mentoring (Ornston, 2021) more than the provision of specialized services (Bathelt et al., 2011, pp. 479–480; Deloitte, 2017). Contrasting Communitech with OCRI, Gary Will, a Communitech veteran and longtime industry observer, concluded “Just about the best thing we did at Communitech was move the focus away from [commercialization] toward expertise, EIRs [entrepreneurs-in-residence], mentors, and things like that” (Will, n.d.). Even this statement is misleading as interviewees suggested that the comparative advantage of Communitech was less the deep but narrow expertise associated with veteran entrepreneurs-in-residence and professional staff than the broad, generic knowledge that gets diffused through dense, encompassing peer-to-peer mentoring networks (Ornston, 2021). As one interviewee described,

> Communitech has a CEO peer to peer group that's going quite well. And we're all at a similar stage and there's about 20 of us and so 15 of us meet about every two weeks. That's really helped because now I have peers that I can like call up and ask questions to and stuff like that just happened in the last year, they've had a couple of different roundtables like Communitech does once a year, bringing all the CEOs together. I have said like make it twice a year and this is so valuable. I get to run into people and ask them questions and reconnect and like I get the knowledge of the community at those events they started doing, quarterly kind of roundtables with similar sized companies (interview W46).

These connections were fostered, in part, through an early emphasis on the development of a common, co-working space through the redevelopment of the historic Lang Tannery building. Indeed, while public perception of Communitech's *programming* was mixed (Deloitte, 2017, p. 165), the organization received high marks for fostering greater connectivity within the startup community (Ornston, 2021), underscoring its role as a network builder (Spigel, 2017a, p. 300) rather than a service provider. In addition to directly connecting individuals through its programming and creating shared working space, the organization's consistent emphasis on mentoring made employees more willing to seek mentors and industry veterans more likely to donate their time than in other regions (Ornston, 2021; Spigel, 2017a, p. 300).

Those peer-to-peer mentoring networks were in turn credited with diffusing generic advice about how to start a business throughout the community,

> One of the first things I did [when I moved here] was to join a peer-to-peer group at Communitech … The thing that struck me was the way the community was open and willing to share with each other. I came in as an outsider and I had people to reach out to with questions. How do I do SRED [Scientific Research and Experimental Development] tax credits? Who is the best person to go to? What should my option plan look like?" (Interview W5).

This type of generic information was particularly useful for new founders, teaching firms how to circumvent the institutional constraints of a peripheral, capital-scarce region through

improvisation and internationalization (Creutzberg et al., 2023; Herrmann, 2009), mentoring networks taught firms how to secure risk capital from Toronto and other cities (interview W13 and W14), import human capital from outside the city (interview W5), co-locate closer to international customers (interview W38), construct dual office structures (interview W6), and manage remote workers (interview W42). As a result, the dominant picture of Communitech was one of accessibility. As an industry representative concluded, "[Communitech] creates a story where you belong, you see how you can contribute to the next wave of whatever might happen, and you feel ownership of [that]" (interview W33).

This programming may have helped to supported startup activity in Waterloo, but there was an opportunity cost to this accessible structure. First, an organization built and governed by "rebels" and "little guys" could not mobilize either private or public capital on the scale of MaRS. Reflecting on the organization's launch, an early participant noted, "Our Member of Parliament had committed to put in $250,000. We never got that money. It took a few years to get that" (interview W43). The emphasis on peer-to-peer mentoring was thus not simply a function of Communitech's devotion to young startups, it also reflected its initial capital scarcity. This constraint has softened over time as effective storytelling enabled Communitech to attract external resources (Ornston, 2021). The establishment of the Ontario Commercialization Network and Communitech's elevation into a leading regional innovation centre gave it the provincial resources to expand its programming (Bramwell et al., 2019), while its role in administering the federally funded Canadian Digital Media Network (now Canada's Technology Network) broadened its external reach. This process took years, however, and even today Communitech's physical footprint (110,000 square feet) remains considerably smaller than

MaRS' (1.5 million square feet) and it continues to rely on its larger partner for specialized programming such as market research, business market validation, and educational courses.

Communitech's modest resources were compounded by the organization's struggles to specialize. Because it was accountable to the entrepreneurial community as a whole (interview W47), Communitech could not concentrate its resources by placing sector specific bets like MaRS or OCRI. Even the Canadian Digital Media Network was largely sector-agnostic, launching initiatives such as Communitech Outposts, which benefit all tech companies by making it easier to hire abroad. As a firm familiar with the two organizations described it, "The Communitech model is a bit more grassroots. Let's get some incubators going …. Let's throw a lot of stuff at the wall and see what happens" (interview T23). One early member even worried that Communitech's commitment to the entire community has diluted its focus on technology, citing the organization's recent leadership in the provision of PPE and COVID testing (interview W47).

Nor could Communitech rely on MaRS' insulation from the local, entrepreneurial community to prioritize international or non-technology partnerships (see below). Cross-sectoral collaboration with locally-based industries such as agriculture, insurance, and even advanced manufacturing has been conspicuously underdeveloped (Bathelt et al., 2011, pp. 474–475), even among startups which would be most likely to benefit from these adjacencies (interviews W6, W32, W38, and W43). Efforts to stimulate stronger industry-entrepreneur collaboration through the creation of corporate innovation labs generated revenue (Sirois et al., 2022) but, unlike MaRS, never became a priority and proved short-lived. Consequently, Communitech lagged MaRS and OCRI in the development of deep, sector-specific expertise. One technology scale-up saw itself "outgrowing" Communitech,

> I'm not learning as much from [another local scale-up]. We used to have the commonality of a large addressable market in the public sector. When you're starting some of those early, high-level tips [are useful]. But we're in the business of [identifying niches] right now … That's pretty specific. So, then you start looking and saying, "Do I start relating more to someone because they're in proximity to me? Is proximity a valuable asset?" (interview W48).

Finally, Communitech's devotion to the startup community can suppress the "creative destruction" that underpins a healthy entrepreneurial ecosystem. Despite its smaller resources and geographic footprint, the organization supports a large number of startups (800). Although Communitech has become more selective in recent years, redirecting some firms to web-based services, referring others to different regional innovation centres, and increasing support for scale-ups (interview W47), one industry veteran remarked, "We do a good job with startups. We don't kill them fast enough though. You can't coddle them, you have to kill them. …. We're great at starting, not killing or growing" (interview W43). The lack of labour market churn is further compounded by the strength of peer-to-peer networking, which makes it difficult for scaling firms to poach labour away from their slower growing colleagues (interview W48).

Strong peer-to-peer networks, without large pools of capital or deep, task-specific cooperation, led Waterloo-based firms to assume a distinctive position in high-technology markets, using the university's world class engineering curriculum and co-op (apprenticeship) placements to target slower growing, high-technical niches with lower capital requirements which are generally overlooked by larger players (Creutzberg et al., 2023). As a result, the region has historically been defined not by fast-growing unicorns, but rather by small and medium-sized players such as D2L in digital learning, OpenText in search, and Miovision in traffic signals (Howitt, 2019, p. 240). Even RIM started with an industrial logic controller for manufacturing firms and an electronic barcode reader for Hollywood film students and only broke into mass consumer markets after pitching its innovative handset to corporate executives (McNish and

Silcoff, 2015). The region's ability to attract external resources and scale firms has increased significantly in recent years (see below), but locals have historically characterized the region's comparative advantage thusly, "Waterloo solves hard, boring problems. Valuable problems, obviously. Business-to-business is pretty good …. But let's face it, it's not sexy" (interview W18).

Toronto: Institutional Leadership and Cross-sectoral Buzz Building

The founding of MaRS could not be more different from Communitech. Like Waterloo, Toronto also punched below its weight in high-technology entrepreneurship until the 2010s. Despite deep stocks of human and financial capital, leading universities, and advanced industry, the region lacked an entrepreneurial culture (Lucas et al., 2009). As one former entrepreneur described it, "When I was starting my company, there was nothing. I was on my own. There was nobody to turn to. I knew no other entrepreneurs; I was making all the mistakes on my own" (interview T16). In this environment, the high-technology enterprises best positioned to capitalize on these assets were multinational subsidiaries in information and telecommunications hardware (Britton, 2004; Creutzberg, 2006). Successful, locally owned, high-technology startups such as Delrina and Workbrain were the exception rather than the rule.

The rise of high-technology entrepreneurship in the 2010s reflected a multi-pronged effort to develop the region's civic capital, shaped by a variety of organizations, including TechTO (Denney et al., 2021; Creutzberg et al., 2023). The MaRS (Medical and Related Sciences) Discovery District was the brainchild of Dr. John R. Evans, a high-ranking doctor in the Toronto medical community, who wanted to promote the commercialization of medical

research and "facilitate access to technical and business support service onsite or in neighbouring academic institutions" (Evans, 2005). As a Toronto industry representative explained:

> Toronto General Hospital building [was] going to be torn down and turned into condos and John Evans was like, 'That's ridiculous. This building is the heart of so much intellectual property activity– how about if instead we find ways to commercialize it?' And so, the whole founding of MaRS was based on being a centre for convergence and for, you know, the uniting and bringing together of all of the pieces that you need to commercialize technology right, the research from academia, the dollars from Bay Street and the policy from Queen's Park (interview T16).

To do so, he leveraged his connections within the business, civic, political, and academic communities, partnering with 13 private and not-for-profit actors in 2001.[6] The resulting RIC looked radically different from Communitech. MaRS' current board of directors still reads like a who's who from established industries, including natural resources and energy (three), finance and investing (three), medicine and pharmaceuticals (two), the legal field (two), academia (two) and finally IT and cybersecurity (two). As of 2021, it included only five entrepreneurs, one of whom, CEO Yung Wu, was specifically brought on board to address MaRS' deficits in this area (interview T17). As a Waterloo industry representative described it, "Communitech was founded day one by entrepreneurs, the investors are all entrepreneurs and tech people. MaRS has had on their board bankers and people who've never been at a tech company" (interview W25). A Toronto firm representative confirmed, "[Board members at MaRS are] not entrepreneurs, so they don't meddle. They let me build what I want to build, which is excellent. [But] I do wonder

[6] MaRS' College of Founders included AIC Limited, AstraZeneca Canada, Baycrest, Lawrence S. Bloomberg, Cancer Care Ontario, CIBC, Eli Lilly Canada, John R. Evans, The Henry White Kinnear Foundation, Arthur S. Labatt, MDS Inc., NPS Pharmaceuticals, St. Michael's Hospital, Peter Munk, RBC Financial Group, Joseph L. Rotman, Allan Slaight, and Toronto Rehabilitation Institute. As one interviewee described it, "When you start in the atrium, … those names are people that John knew personally, the Labatt family, Bronfman, Lawrence Bloomberg …. These guys had a million dollars each to donate" (interview T23).

if having such a corporate board, if we're missing an opportunity by not having more entrepreneurs on the board" (interview T16).

MaRS' comparative advantage relative to Communitech and OCRI was its access to capital and connections. To attract venture capital and business and support services for startups in the science and technology disciplines (Evans, 2005), civic leaders invested $14 million of their own capital to purchase a large (1.5 million square foot) piece of real estate in central Toronto – the old Toronto General Hospital strategically located beside the Legislative Assembly of Ontario, the University Health Network, and the University of Toronto. They also leveraged their connections to secure resources from the University of Toronto and the province (Evans, 2005), the federal government (Tamtik, 2018, p. 9), and leading organizations such as Royal Bank of Canada and Ogilvy Renault LLP (Sá and Lee, 2012). In contrast to Communitech, which slowly secured more resources through clever storytelling (Ornston, 2021), these external capital injections immediately transformed MaRS into what one interviewee described as a "mammoth" (interview T17). MaRS was physically large, in ways which would shape its future strategy (see below). The phase one tower 1, completed in 2005, and the phase 2 tower, completed in 2016, have 1.5 million square feet of office, event, and lab space, dwarfing Communitech's 110,000 square foot footprint.[7]

MaRS was also large in the scope and scale of its activities, offering more expensive and expansive programming than any other RIC. After claiming, "The big dog without any bias is MaRS …. It's got by way of critical mass a certain moment advantage and bench strength that the smaller RICs can't compete with," an interviewee above pointed to MaRS own venture capital fund (interview T21). Administering the province's Business Accelerator Program, which

[7] Revealingly, however, MaRS lacks a dedicated coworking space for entrepreneurs.

delivers entrepreneurial instruction and market intelligence, has enabled the RIC to develop other competencies as well. Interviewees pointed to "things [like] market research, there's a dedicated team [at] MaRS that's available…not all of the smaller regional innovation centres have the ability to do that. MaRS can" (interview T21). Its level of expertise is unmatched in Ontario. In fact, it actively works with smaller regional innovation centres across Ontario as a "supplier of support," providing these RICs and their clients with "market intelligence, training, information, [and] seminars" (interview T26). This was confirmed in interviews with other innovation intermediaries, which, with fewer resources, have sought to niche around MaRS rather than attempting to replicate its strengths (interview T18, T19, and T26).

Finally, MaRS' backers could also draw on a broader network of connections to complementary industries than either Communitech or OCRI. For example, MaRS enjoyed especially close ties to Toronto's financial district, Bay Street, due to early support from banks like RBC and CIBC who could provide capital to startups. MaRS' access to capital "VCs, corporate VCs, a lot of the big banks" (interview T25) and its connections to "both Canadian and international venture capital groups" (interview T22) has been a significant differentiator from other RICs. As a former advisor described it, "MaRS [has] … a different type of firepower that could be deployed in areas such as capital introductions, deep strategy, connections to additional talent, and networking into the United States" (interview T20). A firm representative confirmed,

> I feel the benefit of being able to reach out to [the board at MaRS] when we need to contact the Royal Bank, where I can reach out to Annette, because Annette's in the clean tech world, our chair. So, it's really easy for me to flip an email to Annette and be like 'Hey, do you know so and so in the government?' It's incredibly helpful having very well-connected people that you can engage with (interview T16).

Meanwhile, early supporters such as AstraZeneca and MDS Inc. helped to provide a pathway to commercialization for start-ups in the medical/health fields. These links to large, private sector incumbents facilitated global connectivity (interviews T21, T25), attracting leading multinational corporations to their campus, and attracting over 200 site visits a year (Deloitte, 2017). [8]

MaRS' unique connections to a wide variety of different sectors (Evans, 2005, pp. 280–281), in addition to the aforementioned provision of capital and its strong reputation, has been its ability to connect firms within specific industry verticals, delivering specialized intelligence, expertise, resources, and clients (Deloitte, 2017, p. 167). As one employee described it,

> We work with large corporates globally, to help them address their problem statements as it comes to potential tech solutions. And so, we're that natural broker between a corporate and a venture to help the corporate address their solution … [from] the ventures that are within our network. A lot of startups that we support, we're helping them from a customer access perspective. And not only in Toronto, … but [also] globally (interview T25).

In contrast to Communitech's role in constructing broad-based, peer-to-peer mentoring networks, industry representatives more frequently commented on MaRS' senior entrepreneurs in residence (interview T27). Instead of diffusing generic advice about how to launch a firm like Communitech, these veterans were more likely to deliver sector-specific expertise, connections to capital, and clients. As one tech executive remarked, "MaRS connected us to customers, [a prominent bank] is a long customer, and now this gives us more credibility" (interview W46). At

[8] While receiving federal and provincial funding, MaRS generates most of its revenue by leasing their office space to over 120 tenants. This structure improves connectivity to an impressive array of multinational corporations (Microsoft, Samsung, and CIBC), academic and applied researchers (University of Toronto Faculty of Medicine, the University Health Network, and Ted Rogers Centre for Heart Research), investors (BDC, Cycle Capital Management, MaRS IAF) and service providers (NRC, RBC Research) and funds MaRS' entrepreneurial programming. But it has also yielded mixed results as MaRS faces a tension between renting out space to large, established firms versus supporting startups with affordable office space (interview T28).

the same time, these narrow, one-on-one relationships vary in quality. As one firm representative put it,

> [Our advisor] left unfortunately. [Until then,] she was really keen and our main point of contact. So, when I had any challenge, I wanted to ask some questions, 'So okay, how do we do that?' she was really helpful. But I guess we were lucky and not all the companies are. It's a personal relationship (interview T28)

MaRS' insulation from the entrepreneurial community has also given it the flexibility to target its resources. This has not always been the case, as the RIC's easy access to resources initially led to mission creep and overexpansion (Deloitte, 2017). But the organization has had an easier time reorganizing around scaleups in a limited number of sectors, specifically Health, Cleantech, Fintech, and Enterprise, Mobility and Transportation, and Advanced Materials and Manufacturing. A MaRS senior advisor explained that startups will argue that "you're the government and you should bring us in," and our response is "a) we're not the government, and b) we don't owe you" (interview T16). MaRS is also more selective in the ventures it supports. Another MaRS senior advisor described how, "We don't take everybody. And the primary reason we wouldn't take companies is whether or not we feel that we can help them move forward… So, we're fairly selective" (interview T22). In contrast to other Ontario RICs which have historically tended to "be more hands on with these early-stage startups" (interview T25), MaRS focused on scaleups, relying on other organizations, including accelerators such as the Creative Destruction Lab, incubators like DMZ, or TechTO (see below) to deliver this support (interview T16). A Toronto entrepreneur remarked, "For MaRS you have to be at a certain stage, revenue positive before they'd even shed light on you. The accelerator program is super picky" (interview T17). Other startups are deterred by high costs (interviews T28, T31), particularly for space as MaRS attempts to recoup its early, ambitious real estate investments.

As a result, MaRS is widely perceived to be less accessible than Communitech. In addition to being more selective, the organization's size and scale is difficult to navigate. A founder familiar with MaRS commented, "[MaRS is] not as structured as Communitech," while another remarked, "MaRS is big in a bureaucratic way. You have to rise to the top to get those resources" (interview W46). An advisor familiar with the organization remarked,

> You go into MaRS, you see this big atrium, and you think you're in a bank and you get lost, right? I always found people have trouble with MaRS because you couldn't understand MaRS by going in the front door. You had to sort of know people and work your way from … your own networks to really get with MaRS (interview W47).

A representative from a large firm agreed, "I think the focus is one how do you build up vibrant scaleups, but there's something unique about Communitech …. It's not at MaRS, [it's] an incredible building, the hook into life sciences and biotech. They don't have the same kind of connective tissue into startups that Communitech does" (interview T23). Another client commented,

> [Tenants at MaRS] do their own things. Nobody cares about what their neighbour is doing. There is Microsoft, we don't have to know at all about what Microsoft is doing… At some point they had Airbnb. Okay. Two years ago, they had Uber as well. And now they have Real Ventures, at some point Norton Rose. But there's no programs, there's no bridges between whatever those companies do… It doesn't impact our activity at all (interview T28).

As a result, MaRS' strongest resources, particularly its networking opportunities, are not always structured in ways that startups can access. Contrasting Communitech with MaRS, an entrepreneur remarked,

> MaRS will connect you to marketing experts, they have PR experts. They have big, connected, in-house legal counsel. So, they have all these things, services that they will offer. But none of them had the startup flavour. Because this is the same

> legal advisor that would advise an industrial company that has been there for like 30 years. …. I'm like, "Dude, we're a startup" … because they look for a 50-page business plan, whereas all I have is like one page (interview T17).

The gulf between MaRS' deep bench of sector-specific expertise and the needs of a startup is compounded by the relative weakness of peer-to-peer mentoring networks, the absence of a co-working space, the high cost of rent, and a self-acknowledged lack of community more generally (interviews T16, T27, T28, T30). As a result, one's experience at MaRS is heavily dependent on the relevance and quality of your entrepreneur-in-residence or senior mentor (interviews T28, W47). The least favorably evaluated EEI by its clients (Deloitte, 2017, p. 165), this spotty patchwork of support has prompted critiques that MaRS doesn't understand startups or is beholden to large, foreign firms (McIntyre, 2018; McQueen, 2014), driving an even deeper wedge between the organization and the entrepreneurial community. MaRS appears to have acknowledged these weaknesses, appointing its first entrepreneur CEO Yung Wu in an effort to re-centre technology startups (interview T23) and attempting to build a stronger sense of community within its industry verticals (interviews O21, T17).

Naturally, MaRS' ability to mobilize resources around scaleups and its struggles to integrate the entire entrepreneurial community are partly a function of Toronto's sheer size, which dwarfs Waterloo and Ottawa. MaRS' governance structure, however, does distinguish it from other EEIs in the local ecosystem. For example, TechTO, a networking organization founded and led by entrepreneurs, also seeks to promote greater connectivity within the local ecosystem by supporting high-technology startups. As an organization with an informal structure based on meetups of over 8,500 founders and entrepreneurs, Denney, Southin and Wolfe argue that TechTO has delivered a broader and more inclusive platform for startups in a wider range of industries (Denney et al., 2021, p. 202). Without the support of large, institutional actors,

however, it more closely resembles Communitech's comparative advantage in peer-to-peer communication. While the specifics vary, Tech TO's reliance on an accessible, capital-light approach to ecosystem incubation appears to be less a function of city size or other geographic characteristics than the structure of the organization.

Ottawa: Industry-led Cluster Organizing

Unlike Toronto and Waterloo, Ottawa had an established, high-technology tradition based around federal research bodies such as the Defense Research Board and the National Research Council and the defense contracting industry (McDougall, 2015; Spigel, 2011). In 1962, Northern Electric, precursor to (and henceforth referred to as) Nortel, established its telecommunications R&D operations in Kanata, an Ottawa suburb. This "magnet organization" would attract thousands of researchers to the region and serve as a hub for local cooperation (Harrison et al., 2004, p. 1062). By the 1980s, the research laboratory had directly or indirectly spun off dozens of companies including Foundation Instruments, Inc., JDS, Mitel, MOSAID, ORCATech, QNX, and TFK Solar Systems (PricewaterhouseCoopers, 1998), which engaged their parent as a subcontractor or in regional initiatives such as the Canadian Microelectronics Corporation (Niosi and Bergeron, 1995, pp. 54–55).

The Ottawa Carleton Research Institute (OCRI)[9] was founded in 1983 with the objective of promoting research cooperation and strengthening the Ottawa tech ecosystem (Coll, 2004; Ghent-Mallett, 2004). Formed by local leaders, the organization was precipitated by the failure to attract a Hewlett Packard research facility and inspired by the close relationships between the

[9] Later renamed the Ottawa Centre for Research and Innovation and then rebranded as Invest Ottawa in 2012

University of Waterloo and local industry (Julie, 2016).[10] OCRI's initial founders included the Regional Municipality of Ottawa-Carleton, the federal National Research Centre and the Communications Research Centre, two real estate companies, and seven tech firms. In addition, three local institutes of higher education, the University of Ottawa, Carleton University, and Algonquin College, shaped governance and served as a central focal point for cooperation within the region. OCRI's funding structure reflected this membership base. $200,000 in municipal funding was matched by $200,000 in membership fee revenue from just nine local business partners (Ghent-Mallett, 2004). Over time, OCRI would receive dues from over 600 organizations and individuals (Scarchilli, 2003) in addition to event registration, which regularly exceeded 1,300 per month (O'Sullivan, 2004). Nortel and a handful of large, telecommunication firms, however, continued to dominate the organization (interviews O2, O24).

The interests of these large, established technology firms, which have an easier time commercializing basic, university research than their younger, smaller counterparts (Gergils, 2006, p. 313; Ornston, 2018, p. 46), shaped OCRI's mandate in important ways. While the organization would expand to include a technology executive breakfast, joint marketing and legal forums, and entrepreneurial classes (see appendix), the organization focused principally on industry-university collaboration. In its first annual review, the organization pledged to "promote an increase in the resources available for research and development [and] promote interaction between education, government, and business personnel; [and] support regional development in high-technology sectors" (OCRI, 1986). In its first three years, the organization constructed a Focused Ion Beam facility, institutionalized the Ottawa-Carleton Centre for Communications Research, supported the Canadian Microelectronics Corporation consortium, used the

[10] At this time, those ties were stronger with traditional industry, which had played an important role in establishing the university in 1959 (Nelles et al., 2005).

(university-focused) Ontario Centres of Excellence program to build the Telecommunications Research Institute of Ontario, and used industry and Natural Sciences and Engineering Research Council funding to develop computer aided design tools (Caughey, 1984, p. 5; Julie, 2016, p. 5). These research initiatives, which were deepened by the Optical Processing and Computing Consortium of Canada and additional funding for the Canadian Microelectronics Corporation consortium (Niosi and Bergeron, 1995, p. 55), were flanked by educational initiatives, including the rapid growth of specialized engineering programs (PricewaterhouseCoopers, 1998; Spigel, 2011) and an extension to primary and secondary school outreach after 1987 (Julie, 2016, p. 6).

This emphasis on specialized research, infrastructure, and education created unique opportunities for entrepreneurial, small- and medium-sized enterprises. New firms could use collaborative research networks and engineering programs to connect to large telecommunications equipment producers such as Nortel, while applied research projects created spinoff opportunities for established employees, particularly when coupled with a large and growing pool of risk capital. As one interviewee described it, “Nortel started to do it, and [Terry Matthews] did it on the Newbridge side. It became known that if you were an engineer that wanted to build a product that [wasn’t] on their product roadmap, not only are you free to go, we'll fund you” (interview O19). The number of high-technology firms in Ottawa doubled between 1990 and 2000 (Spigel, 2013, p. 98) and the region ranked first in Canada in per capita-adjusted measures of venture capital investment by the turn of the millennium (Florida and King, 2015, p. 13). Consistent with an entrepreneurial ecosystem, most VC investments were aimed at growth-oriented enterprises requiring $500,000 to $5,000,000 and there were 100-150 active angel investors, most notably the “Blue Angels Group” associated with Nortel employees and alumni (PricewaterhouseCoopers, 1998). In contrast to Waterloo, the deep, sector-specific

expertise from specialized engineering and R&D programs enabled the region to scale local startups such as JDS and Newbridge Networks within an intensely competitive, capital-intensive industry.

Even at its height, however, OCRI exhibited several weaknesses relative to Communitech and MaRS. The organization excelled at bridge building, but the emphasis on basic research and education required strong private sector partners to commercialize those insights and deliver complementary expertise. For example, OCRI funded entrepreneurial courses, executive breakfasts, and other forums, but entrepreneurs typically looked outside of OCRI, to telecommunications veterans such as Terry Matthews, for connections and tacit knowledge. In other words, the effective commercialization of basic research hinged on the existence of incubator-like firms such as Newbridge Networks and telecommunication-based social networks such as Tech Tuesdays (interviews O10 and O19). Comparative studies suggest that whereas only 25% of Waterloo's entrepreneurs knew their mentor in advance (having been connected by Communitech), virtually all of Ottawa's entrepreneurs did (Spigel, 2017a, p. 300). The relative shallowness of peer-to-peer and even senior-junior mentoring networks was compounded by the failure to create a Waterloo-like culture of mentorship (Spigel, 2017a, p. 301), not least by the virtual absence of dedicated co-working space (never a priority for large, technology firms) until the launch of Bayview Yards in 2016.

OCRI's emphasis on research and education over mentoring and similar forms of connectivity narrowed the sectoral focus of the organization and the region more generally. Despite branching out into other fields such as biotechnology in the mid-1990s (Julie, 2016, p. 5), Ottawa remained a "telecom town" (interview O2). Five of the region's largest six firms by employment and six of the top ten by revenue were in the telecommunications sector in 1998

(PricewaterhouseCoopers, 1998) and five of the six technology firms which went public after the dot com crash (March Networks, RAM Telecom, Bridgewater Systems, DragonWave, and Mitel) operated in the telecommunications space. The failure to develop a robust, independent mentoring network left firms outside of this niche with limited support. As one entrepreneur, who eventually left Ottawa, described it, "Celtic House, like the big Ottawa guys, all they did was infrastructure. They were Terry Matthews' little baby or whatever. … I wasted so much time talking to those guys. But all [the software] founders did. And the angel groups were the same …. We were all a bunch of software folks" (interview O19).

These fragile foundations were exposed when Nortel collapsed in the wake of the dot com crash, taking down large swaths of the local telecommunications industry with it. In contrast to post-RIM Waterloo, which stabilized high-technology employment by reallocating labour from its declining flagship firm to student-run startups (Spigel and Vinodrai, 2021), high-technology employment declined by roughly 20% in Ottawa as the region struggled to leverage new opportunities in software. OCRI's emphasis on research and development, which had worked so effectively in complex, capital-intensive industries such as telecommunications equipment, particularly when paired with rapidly expanding anchor firms, was poorly adapted to the needs of the new software startups which emerged in the 2000s (Ornston and Camargo, 2022). In addition to their more modest human capital and R&D requirements, software startups seeking mentorship outside of the telecommunications industry found little support at OCRI (Spigel, 2011). The organization's mentoring program consisted of a centralized question-and-answer service with no Communitech- or MaRS-style co-working space or mentoring programs (Spigel, 2017b, p. 301). As a result, entrepreneurs outside of the telecommunications industry in

the aughts describe a process of bootstrapping their own development, finding their own way with minimal support from OCRI (interviews O16 and O17).

A merger with Ottawa Economic Development in 2001 led the city to gradually supplant Nortel as OCRI's anchor. This stabilized finances as private sector revenue dwindled in the wake of the dot com crash, but, at least initially, did little to overcome the weaknesses above. A full analysis of a government-led RIC is beyond the scope of this paper, not least because the organization increasingly resembled a traditional development agency, focused on attracting foreign direct investment to Ottawa (for more on this transformation, see Julie 2016). The new governance structure nonetheless mattered, however, subjecting OCRI to unparalleled political interference.[11] Whereas Communitech was responsible to the entire entrepreneurial community and MaRS' autonomy and resources could lead to mission creep, OCRI found itself pulled in a million directions in the aughts. In the words of a former OCRI employee:

> The analogy that I would use is a bad renovation … Rather than just tearing the damn thing down and building a brand-new house, we built a second story and then we built a spot over the garage and then we built up the back and none of it fit together …. Because there were so many different things going on, we were beholden to every single politician ... My day job was constantly dealing with, you know, city councilors because they have a constituent wanting to start a business and what was I going to do for them? …. Then we had a bit of a problem in that our president at the time [supported the wrong mayoral candidate]. Jim Watson was not going to put up with supporting an organization whose president had supported his rival. So that was a bit of a shit show.

By the end of the decade, mayoral candidate Jim Watson campaigned against the association, remarking "How many of you know what OCRI stands for, let alone what it does?" (Kovessy,

[11] In addition to OCRI's struggles to strengthen its mentoring activities during the aughts, the organization continues to broker large-scale, applied, industry-university R&D projects today (see below).

2010) and up-and-coming Shopify CEO Tobias Lütke dismissed it as running "golf tournaments for lawyers" (Silicoff, 2015).

OCRI would eventually find its footing in the 2010s. Redubbed "Invest Ottawa," the government-led RIC benefited from mayoral support, a clearer mandate to promote high-technology industry, and an infusion of public sector resources. The organization created a common space, Bayview Yards, to foster greater connectivity and has launched four tiers of entrepreneurial support (see appendix). Consistent with our thesis, however, the organization's ability to promote startup activity did not appear to originate with local government, large technology firms, or universities. Instead, Invest Ottawa mimicked the programming of and hired ex-founders from Fresh Founders, a cross-sectoral network of software entrepreneurs based in downtown Ottawa (Spigel, 2013, p. 117; Silicoff, 2015). Invest Ottawa's focus on high-technology entrepreneurship was also shaped by the Ontario Commercialization Network (now the Ontario Centre of Innovation) which mandated greater coordination among the three EEIs as a condition to receive provincial funding (Bramwell et al., 2019).

Although Invest Ottawa has thus converged with Communitech and MaRS, it never fully erased its incumbent-led origins. Invest Ottawa continues to support of specialized, industry-university infrastructure with few parallels at Communitech or MaRS. During the 2010s, for example, Invest Ottawa, working closely with local universities, brokered the CENGN and ENCQOR next generation telecommunication networks to anchor multinational telecommunications subsidiaries to the region and it co-funded the Area XO track to test autonomous vehicles (Creutzberg et al., 2023; Haley et al., 2017). By contrast, the organization appears to be playing catch-up in entrepreneurship. While more open to young startups than

MaRS (interviews O19, O23), one supportive interviewee suggested that its external connectivity remains limited,

> I'd say Invest Ottawa helped me a little bit more, but MaRS events and the ecosystem was more dynamic. So, I got more connections at the Toronto events. And I got more connections in Toronto because my investors and my board members were in Toronto. So that's where I was getting more connections. But, you know, I got my IRAP ITA from Invest Ottawa, I got some other things from Invest Ottawa that actually helped on a one-to-one basis (interview O19).

Meanwhile, and in contrast to Communitech, Invest Ottawa continues to prioritize formal instruction and entrepreneurs-in-residence rather than peer-to-peer mentoring (interviews O18, O22, O24). As a result, industry representatives suggest that their experience with Invest Ottawa, like MaRS, has been hit-or-miss, heavily dependent on the quality and relevance of their individual advisor (interviews O18, O19, O22, O23, O24).

Conclusion

This comparative study of Communitech, MaRS, and Invest Ottawa suggests that RICs can play a constructive role in entrepreneurial ecosystem formation by increasing connectivity, brokering investment in public goods, and developing a common identity. At the same time and consistent with our hypothesis, RIC origins have an importance influence on their programming and, by extension, the structure of local civic capital. Communitech, established by entrepreneurs and rooted in the Atlas Group of the 1990s, was particularly effective at developing a strong sense of community, facilitating peer-to-peer mentoring, but it was characterized by weaker external linkages and eschewed task-specific cooperation. MaRS, the brainchild of civic and industrial elites, used senior entrepreneurs-in-residence and external connectivity to generate cross-sectoral buzz, but struggled to develop the sense of community which might support

smaller enterprises. Finally, OCRI, led by large, technology firms, strengthened research collaboration and formal education, but was less effective in supporting new firms outside of telecommunications. These findings suggest that policymakers seeking to incubate entrepreneurial ecosystems face tradeoffs in the organizations they support, as different governance structures lead to different patterns of connectivity.

These distinctions were not permanent. Invest Ottawa's recent activities reflect convergence among Ontario's three leading RICs, not least because the province stabilized funding, mandated the sharing of best practice, and required coordination among its RICs beginning with the 2005 Ontario Commercialization Network (Bramwell et al., 2019). Provincial (the OCN and its successors) and federal (the Canadian Digital Media Network) funding made it easier for community creators such as Communitech to expand their programming, support scale-up firms, and increase connectivity outside of the region. By contrast, MaRS employees acknowledged the weakness of strong, Communitech-like peer-to-peer relationships and sought to address these deficits with leadership changes and community-creating initiatives (interview T16). The convergence among these three organizations reflects ecosystem maturation, most conspicuously in Waterloo, which boasts an increasing number of scaleups, and Ottawa, which has diversified beyond telecommunications equipment in adjacent (autonomous vehicles, Internet of Things) and unrelated (e-commerce) fields (Creutzberg et al., 2023; Haley et al., 2017).

These positive developments come with caveats. First, although this essay has hypothesized how RIC origins shape both organizational programming and the structure of local civic capital, the impact of RIC programming on entrepreneurial activity merits further study, particularly as it relates to the indirect provision of connectivity, local infrastructure, and identity

building. Second, the long-term evolution of these three EEIs should not obscure short-term tradeoffs. It took almost two decades of local criticism and provincial pressure before MaRS shifted its attention to community making (interview W47). Consequently, the opportunity costs outlined in this paper, although increasingly less relevant to Waterloo, Toronto, or Ottawa, remain relevant for less mature ecosystems. Third, the path toward RIC and ecosystem maturation is not always a smooth one. The near collapse of OCRI, Ontario's oldest and once leading innovation intermediary, with independent, non-profit status and a strong fiscal foundation based on corporate fees, serves as a cautionary tale. The weaknesses which eventually led OCRI to expand its entrepreneurial programming nearly destroyed it. Our decision to focus on three of Ontario's most successful RICs to highlight their differences likely understates the frequency and degree to which these organizations fail.

Finally, although Ontario's RICs have supported startup activity by improving connectivity within their local ecosystem, their ability to tackle the enduring provincial and federal barriers to Canadian high-technology industry, including a reliance on non-selective tax incentives over targeted grants, conservative procurement practices, and weak competition policy (Smardon, 2014; Southin, 2022), remains unclear. Even MaRS' Toronto-based clients receive less funding, scale more slowly, and exit earlier at lower valuations than their US counterparts (Denney et al., 2021). In addition to their limited clout as local actors, Communitech, MaRS, and Invest Ottawa's status dependence on provincial and federal funding places legal limits on their lobbying activities (interview T16). Even if they could more vigorously contest the regulatory barriers to scaling high-technology enterprises in Canada, it is questionable whether they would do so. As leading partners within the Ontario Network of Entrepreneurs (now the Ontario Centre of Innovation), they benefit from the province's heavy emphasis on incubation and acceleration

activity. Indeed, their reluctance to engage in anti-system critique has sparked the emergence of a new intermediary organization, the Canadian Council of Innovators, explicitly dedicated to the provincial and federal regulatory barriers confronting Canadian scaleups and sharply critical of Ontario's RICs (interview T2). Without diminishing their contribution to local, entrepreneurial ecosystems, successfully scaling a national, Canadian-owned technology industry may require new forms of associational governance.

Table 2: Communitech categories of support[12]

	Early startup	Late startup	Scale-up
Eligibility Criteria	Startups in the process of developing an idea or an MVP	Startups in the process of testing their product, and are showing market demand	Businesses with over 20 team members, and are generating revenue from their technology
Program duration	N/A	N/A	N/A
Services	Talent: -Postings on Communitech's job board -Access to local and national compensation data -Access to recruitment support via our Pro Squad -Discounted rates for employee benefits via Tech Life Benefits -Access to peer groups to help develop your team Capital: -Assistance seeking applicable grants, funding and loans Sales: -Customer validation opportunities through the Future of X collaboratives -Access to world-class market intelligence trends and data (through MaRS) Community: -Drop-in advisory services -Curated resource library	Talent: -Postings on Communitech's job board -Access to local and national compensation data -Discounted rates for employee benefits via Tech Life Benefits -Access to peer groups to help develop your team -Recruitment support via our Pro Squad partners -Discounted access to leadership programming via the Communitech Hive Capital: -Investment readiness coaching and potential connections to investors. -Assistance seeking grants and funding and loans -Potential funding opportunities via Fierce Founders Uplift and Intensive Track	Talent: -Hire and manage global talent via Communitech Outposts -Post on Communitech's job board -Access to local and national compensation data -Discounted rates for Tech Life Benefits packages -Access to peer groups to help develop your team -Employer brand and talent recruitment opportunities -Discounted access to leadership programming via the Communitech Hive. Capital: -Connections to investors -Assistance seeking applicable grants and funding and loans -Funding opportunities through private and public networks

[12] https://www.communitech.ca/start-and-grow/your-company/startups-and-scale-ups/

	-Access to Communitech's Startup Slack Channel -Topical AMAs to answer your most pressing questions -Member2Member discounts -Access to pre-vetted business professionals -Google for Startups network perks and access to MaRS suite of startup programming -Access to AWS and Google Cloud credits.	-Opportunities to pilot solutions and sell to big customers through the Future of X collaboratives Sales: -Access to world-class market intelligence trends and data -Enhanced growth services / intensive tracks -Grow your customer via Member2Member discounts Community: -Access to Communitech Growth Coaches -Dedicated lead advisor -Access to Communitech's Startup Slack Channel -Topical AMAs to answer your most pressing questions -Access to exclusive founder peer groups -Access to pre-vetted business professionals -Google for Startups network perks -Enhanced access to MaRS suite of startup programming -IP strategy support	Sales: -Get in front of big customers with Future of X collaboratives -Get boots on the ground in global markets with Communitech Outposts -IP strategy support Community: -Dedicated relationship manager -Access to Communitech Growth Coaches -Access to exclusive scale-up peer groups -Topical AMAs to answer your most pressing questions -Discounted or free events -Member2Member discounts -Access to pre-vetted business professionals via the Pro Squad

Table 3: MaRS programming by firm stage

	Early-Stage Services	**Growth Services**	**Momentum**
Eligibility Criteria	-Have a minimum viable product -Have early customer interest; are close to product-market fit/early validation - Have raised or could raise (pre-)seed investment for product or clinical trials	-Have a product in market with strong customer demand -Building go-to-market capabilities or advanced product trials with input from key partners -Have raised or could raise series A investment for initial deployments	-On track to reach $100 million in revenue within five years -Headquartered in Canada with global ambitions -Keen to engage with executive peers and global experts
Program Duration	N/A	N/A	N/A
Services	Startup Toolkit Workshops Market Intelligence Entrepreneurship 101	Advice on capital, sales, marketing, talent, and recruitment, and regulatory 1:1 expert mentorship Connections to investors, customers, and partners Growth marketing and sales programming Media and PR promotion Referrals to MaRS Investment Accelerator Fund Peer-to-peer events; event news, discounts and speaking opportunities Curated newsletter with exclusive offers	Access to a global, curated community of C-suite executives Data-driven diagnostic and insight tools Customized executive services (organizational design, culture, leadership, sales acceleration, international expansion, IP, risk, financial controls, and M&A) PR, media, regulatory and public affairs assistance Growth, sales, and marketing support

Table 4: Selected cluster organizations in Ottawa[13]

Name	Year Launched	Purpose	Target Audience	Typical Activities and Frequency
Ottawa-Carleton Research Institute (later Invest Ottawa)	1983	Strengthening the Ottawa tech ecosystem by increasing research cooperation	The technology community, mainly large, incumbent firms as well as local universities and government	Monthly registration for OCRI's suite of events exceeded 1,300 at height in late 1990s
Canadian Microelectronics Corporation consortium[14]	1984	Enabling academic-industry collaboration, and reducing barriers to technology adoption through research, development, and training	Firms, researchers, and post-secondary institutions developing advanced technologies	Typical activities included workshops, training sessions, conferences, webinars, and events; Frequency of activities ranges between 2-7 activities each month
Technology Executive Breakfast (TEB)	1993	Top-level networking	Senior executives and management in technology-related enterprises, with a focus on emerging companies	Monthly
Optical Processing and Computing Consortium of Canada (OPCOM)[15]	1994	Promoting the development of optical technologies and the adoption of advanced photonics systems	Optics / telecommunications equipment firms	-
SPIN: Software Process Improvement Network (OCRI has partnered with the Ottawa SPIN since its inception)	1996	Promote process improvement, increased process maturity and high-quality software-based products	Those developing, managing, or procuring software-based products or systems, especially software professionals engaged in software process improvement.	Six main events each season (averaging 100 people from over 50 different companies)
Zone 5	1997	Professional development for technology-marketing community; providing a highly focused networking environment; informal coaching of small and medium companies	Companies marketing technology hardware products, software, and services, from start-ups to the largest internationally active firms	Monthly. Theme for 2003: marketing in turbulent times. Speakers from the Ottawa area and elsewhere in North America

[13] This table draws heavily on O'Sullivan 2004
[14] https://www.cmc.ca/about-us/ ; https://www.cmc.ca/past-events/
[15] https://www.sfu.ca/~jiel/ieee/2008_Rawicz.html

Communications and Information Technology Ontario (CITO)[16][17]	1997	Strengthening Ontario's ICT industries by supporting academic research and fostering university-industry partnerships	Students, universities, and firms	-
TechTalk Ottawa technology research workshops (Joint OCRI/CITO)	1999	Facilitate the flow of research information between high-technology companies and universities and colleges	-	Bi-monthly technology research workshops
45th circuit	2000	Increasing understanding and competence in a wide range of legal issues of particular importance to technology firms	In-house counsel, technology specialists in private practices, public sector counsel, as well as a spectrum of other company officials with a need or interest in emerging legal issues	Monthly speaker events. Speakers are legal professionals and are invited from the Ottawa area and elsewhere in North America
IT in healthcare	n.d.	Health care providers, policymakers, IT entrepreneurs, technology developers, and students	-	Occasional seminars, IT infrastructure development efforts and their costs/ benefits; technology adoption experiences; and new public initiatives to support IT in healthcare
Innotalk applied innovation seminars (Join OCRI/CITO)	n.d.	Help companies find effective answers to process, systems, and technology issues	-	Seminars featuring expert speakers from industry and academia
CENGN	2014	Development of 5G testbed, commercialization, training	Members include MNEs, SMEs, government, universities	-
ENCQOR[18]	2017	Fostering the development and adoption of 5G technology projects in Quebec and Ontario by assisting SMEs with pre-development research, collaboration, and testing	SMEs, industry, government stakeholders, researchers, students	-

[16] (following the merger of Telecommunications Research Institute of Ontario and the Information Technology Research Centre in 1997)
[17] https://cito.ca/about-cito/
[18] https://ontario.encqor.ca/

AREA XO (Operated by Invest Ottawa)[19]	2020	R&D complex designed to accelerate the development, commercialization and adoption of next generation technologies (e.g., connected and autonomous vehicles, internet of things, sensors)	Entrepreneurs, early-stage startups, and scaleups working on next generational mobility-related technologies	-

[19] https://www.investottawa.ca/blog/invest-ottawa-drives-the-future-with-the-launch-of-area-x-o/ ; https://areaxo.com/our-offering/

Table 5: Invest Ottawa Programs (Invest Ottawa, 2022)

	IO Ignition (Pre-Accelerator)	**IO Flex**	**IO Accelerator**	**IO ScaleUp**
Eligibility Criteria	-Entrepreneurs have an idea they you like to validate -Building a tech or tech-enabled product -Have started talking to customers or have initial sales -Want to build network with founders	Meets one of the following requirements: -Graduate of IO Ignition -Demonstrated traction -Looking for a self-driven approach to growing company -Experienced founder	-Developed an MVP -Able to demonstrate customer traction -Less than $2M annual revenue -Able to invest time into the program	-$2M in revenue or capital -On track to reaching $100M
Duration	10 weeks	Self-paced	N/A	N/A
Services	-Curriculum covering startup basics (customer interviews, lean startup methodology, legal, pitching, etc.) -One-on-one mentorship	-Early-stage advisors -Startup perks (discounts on business essential software and services) -Access to IO's Slack startup Slack channel -Peer-to-peer events -Virtual and in-person events	-Expert mentorship -Connections with angel investors and VC -Assistance seeking grants and funding -Access to IO's Market Insights team -Access to specialized peer groups -Access to rent desk space at Bayview Yards	-Access to ScaleUp advisory (elite advisors) -Access to specialized ScaleUp peer groups

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