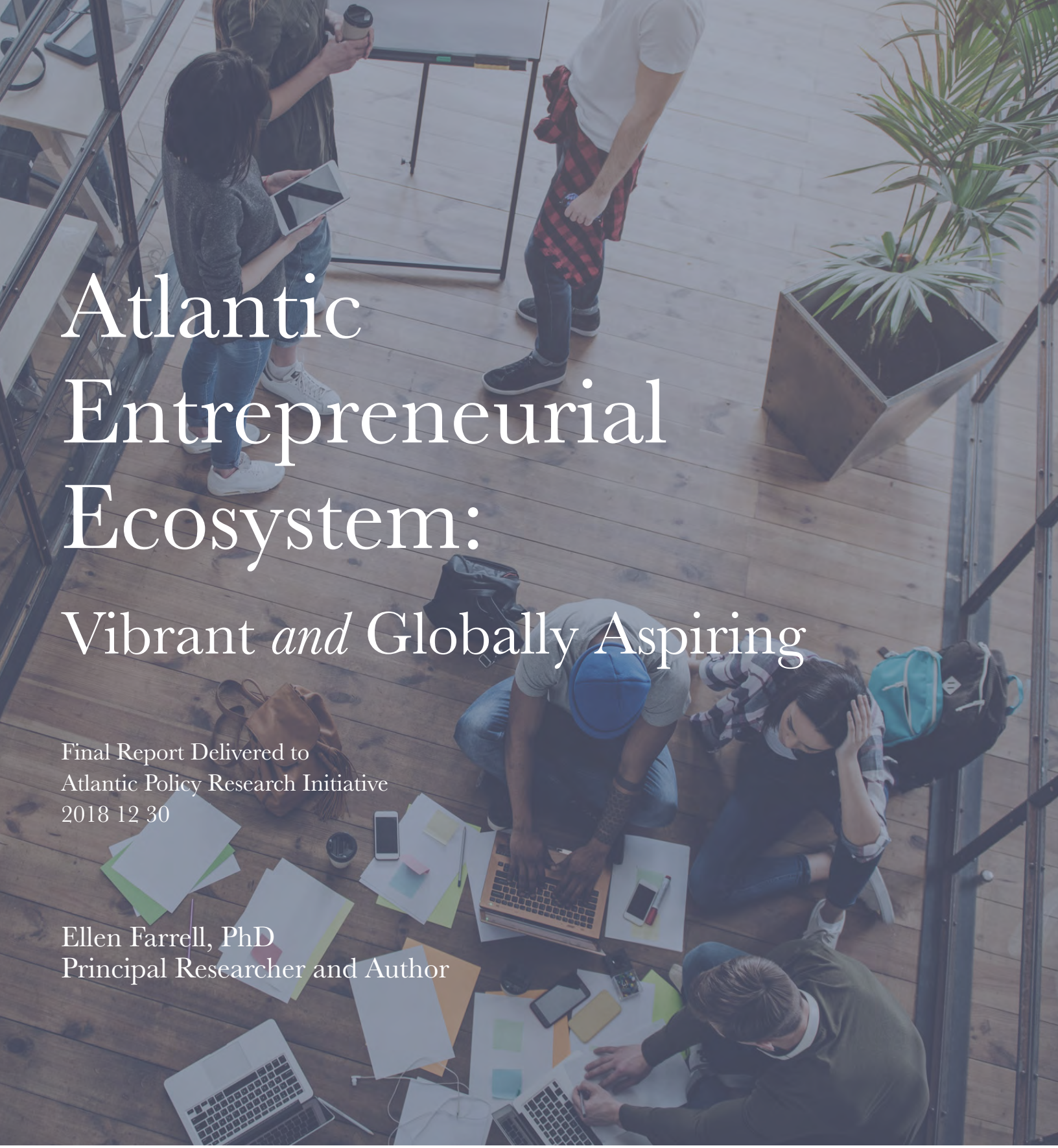


Atlantic Entrepreneurial Ecosystem:

Vibrant *and* Globally Aspiring

Final Report Delivered to
Atlantic Policy Research Initiative
2018 12 30

Ellen Farrell, PhD
Principal Researcher and Author

SAINT MARY'S UNIVERSITY SOBEY SCHOOL OF BUSINESS ENTREPRENEURSHIP

SAINT MARY'S UNIVERSITY SINCE 1802
One University. One World. Yours.

CAPE BRETON UNIVERSITY

UNIVERSITY of Prince Edward ISLAND

UNIVERSITÉ DE MONCTON

EST. 1785 UNB UNIVERSITY OF NEW BRUNSWICK

WALLACE McCAIN INSTITUTE BRIDGING ENTREPRENEURIAL LEADERS University of New Brunswick

MEMORIAL UNIVERSITY

Executive *Summary*

Relationships are important. Relationships are important because innovation does not exist in the air, and entrepreneurial opportunities do not appear out of nowhere. Innovation and entrepreneurial opportunities are based in the curiosity of their founders. Relationships are important as founders forage for opportunities to improve firm performance and entrepreneurial consequences. Curiosity opens entrepreneurs to complementary competencies and to resources that help them gain access to new ideas from previously unknown people. The extent to which entrepreneurs are prepared to develop relationships by reaching out for innovative information to enhance the business and technical aspects of their enterprise improves their prospects and ultimately that of the ecosystem. This research investigates the outreach made by entrepreneurs to improve their businesses, and to define the geographic and digital boundaries of an entrepreneurial ecosystem.

This research is practical, grounded, and evidence-based. The results do not propose a theory, but rather make useful observations that are discussed in the context of other entrepreneurial ecosystems. Rather than an ivory tower study destined to be relegated to a shelf, this research has proved its relevance via the more than 1,000 people who have already participated with it as it was developing. Lastly, it is evidence-based asking people in the ecosystem about their search for information and combining a massive regional picture with 1666 organizations and 3397 examples of knowledge-search.

FINDINGS

This major research project investigated the curiosity of participants in an entrepreneurial ecosystem and mapped who reached out for information, and to whom. This was done by surveying knowledge-seeking behaviors and using network theory to show the distribution of information-seeking activities. This introduces context and looks at the actions of people in the ecosystem -- avoiding focus on the firm or the entrepreneur.

This is not a study of who-knows-who. It is not a study of social networks. It is not a study of Linked-in accounts, nor of Twitter, nor Facebook, nor Instagram relationships. It is not created with big data. It is a carefully constructed investigation using survey data of who is prepared to reach out to innovate in Atlantic Canada`s entrepreneurial ecosystem.

1. COMPLEX KNOWLEDGE-SEEKING ACTIVITIES

The knowledge-seeking activities of the AEE are very complex. There are 1666 different organizations represented in the work and 3397 separate knowledge-seeking activities defined. Fifty-seven percent (57%) of all of the nodes in the AEE represent firms, both entrepreneurial and mature. The next largest group of constituent organizations in the ecosystem are supportive-type organizations (14 %). Financial organizations like VCs, business angels, and banks represent 11 percent of the constituents sought after by respondents. Universities represent four percent of the nodes, indicating a total of approximately 31 different higher educational institutions. The University of Ethiopia is one of them. Participants in the Atlantic Entrepreneurial Ecosystem (AEE) have reached out as far as the University of Ethiopia to build knowledge necessary for their business activities. Various types of federal and provincial governments, and professional firms represent the bulk of the remaining named organizations.

The principal constituent groups are homogeneous amongst themselves and heterogeneous between one another. The various groups of constituents act complementarily – whether deliberately or not – to accomplish the ecosystem's mandate of numerous cohesive interactions.

2. MANY MAKE THE WHOLE

The AEE benefits when all the major groups of constituents noted above are in place. Metrics associated with a subset of data demonstrate the dwindling effectiveness of knowledge-search behaviors (curiosity behaviors) when one of the major constituents is withdrawn. The incremental value that each group of actors contributes to the ecosystem connotes the synergy in the combined group of entrepreneurs, governments, support groups, professionals and venture capitalists. Removing any one of the various groups of actors causes the average degree of knowledge-seeking behaviors to decline. Governments alone do not establish, or mandate, an entrepreneurial ecosystem and the value creation contributions of many actors are working in concert.

3. BUSINESS/MARKET/FINANCIAL INFORMATION DOMINATES KNOWLEDGE-SEARCH

The type of knowledge sought by participants in the ecosystem is dominated by business/market/financial information rather than technical/product information. That the search for business, market and financial information is so much greater than that of product/service/technical is surprising and potentially concerning since product innovations are based in science, technology, engineer and mathematics backgrounds and are equally necessary as business model innovations.

If entrepreneurs are competent in the innovation, design, science and production of their products and their needs are largely related to the development of markets, delivery, sales techniques and methods of building a firm, we are reassured by their search for business information. However, if entrepreneurs' products are lacking in the technical/design/innovation resources necessary to make sustainable and innovative products – and they are spending their time seeking business advice – the outcomes could be troublesome.

4. ATLANTIC-CENTRIC ECOSYSTEM IMPEDES GLOBAL SUCCESS

The interconnectedness of the constituent groups in the AEE is amply illustrated in the research. Approximately 75 percent of the ecosystem's knowledge-seeking behaviors were situated in the Atlantic region. Fifteen percent of the nodes are from the rest of Canada, nine percent of the nodes are situated in the U.S. One percent were globally based beyond the North American continent.

It is hard to know if the 25 percent beyond Atlantic Canada is a reasonable number or not; there is nothing similar with which to compare it, except the anecdotal accounts of other successful clusters of innovation and entrepreneurial ecosystems. Given that the region is geographically closer to Europe than any other place on the North American continent, one cannot help but think it is surprising that there are not more ecosystem constituents reaching out to Europe (Rest-of-the-World category). Given our isolating location relative to North America, it seems reasonable that Atlantic Canadians should reach further afield geographically more often.

Ecosystems that are too introspective lead to dis-entrepreneurship, the term to describe communities that adopt an inward-facing orientation rather than an outward facing orientation in a globalizing world. Global-facing constituents are an inoculation to dis-entrepreneurship by reaching out to distant geographies and distancing themselves from aligning, or relying, on local knowledge or policies alone.

5. ASPIRE TO GLOBAL RECOGNITION

The most successful clusters of innovation are highly connected on a global level. Or does it occur the other way around? The most globally connected ecosystems are the most successful. Global connections span boundaries, bridge structural holes, and connect networks. Globally aspiring ecosystems cooperate to cultivate durable relationships with one another to enhance their resources, leverage information, access markets, and accelerate innovation. Global connections: encourage the mobility of people in and out of businesses and regions; promote the transfer of high technology know-how; encourage the development of born-global firms; increase the participation of specialized support groups to cross-pollinate activities and resources; stimulate the movement of people between industry and academia; and foster deep expertise for specific support mechanisms by learning from one another and drawing on experience.

If the most successful ecosystems and clusters of innovation are distinctive in that their geographic reach is global, and we know about them, do they know about us? Atlantic Canada has much to promote: an active and motivated ecosystem; smart talented entrepreneurs and founders; a host of universities, science and business-based knowledge, and an abundance of entrepreneurs who have had successful exits. The world is beating a path to our door to purchase Atlantic Canadian equity. An incomplete list of the firms which have purchased Atlantic Canadian founders and investors include: Lynda.com (Compiler), SalesForce.com (Radian 6 and Go Instant), IBM (Q1 Labs), Verisk Analytics (Analyze Re), Samsung (New Pace Technologies), Venor (Equals6), AOL (Info Interactive), Patron Technology (Marcato Digital Solutions), American Forest Foundation (Woodscamp), Croda International, UK (Nautilus Biosciences Canada),

Towers Warson (Brovada), AOL (InfoInteractive), Foto Search (CanStockPhoto), Royal DSM (Ocean Nutrition), Legado Capital (Kivuto), Allied Universal (Source Security and Investigations), Vinci Energies of France (ADM Systems Engineering), and Quintiles IMS (STI Technologies) just to name a few. The ecosystem is cultivating great entrepreneurs. Ecosystem actors can expand extra-local ecosystem connection and promotion:

- Develop new international linkages with other ecosystems,
- Create regular coordination of information sharing with other ecosystems to forge new regional links;
- Design and coordinate "campaigns" to create an awareness of the Atlantic ecosystem and its growing list of successful founders and investors;
- Sustain the activity to encourage an increased and growing awareness of Atlantic Canada,
- Combine resources to attend trade missions and trade shows with specific mandates to cultivate promotion of the Atlantic Entrepreneurial Ecosystem;
- Find professional "equivalents" in other jurisdictions to reach out to, and stay in touch;
- Recruit and disseminate information to a specific ecosystem such as North Carolina/Boston/London/Chicago/Israel/Belgium.

6. ADOPT A KNOWLEDGE-SEEKING ATTITUDE THAT EXTENDS TO WEAK TIES

Relying on local knowledge and close friends is known as strong ties. Weak ties are sources derived from individuals who are casual acquaintances, or who are not known to the actor well, or at all. Maybe they met at a conference, or are an unknown expert to whom we reach out. Reaching out for information from persons who are weak ties (not close colleagues, friends and family) produces better fodder for innovation. Individuals who reach out beyond their own personal sphere of influence are spanning boundaries and are bringing diverse domains together with an improved likelihood of reaping disproportionate returns via innovative thinking. Weak ties allow individuals to parse information from diverse subjects and bring significant dissenting and discriminating insights to their innovation or ventures. By not following the leads and dictates of his strong ties, Gregg Curwin at TruLeaf brought vertical farming here from Japan. While it took a number of years for Gregg to convince his strong ties, those outside his normal sphere of influence (weak ties) bought into the system (literally and figuratively) to create a truly innovative Canadian company that is currently highly valued and is growing rapidly.

7. PARTICIPATION OF MATURE FIRMS IN THE ECOSYSTEM

An examination of a sub-set of entrepreneurial firms showed that there is very little interaction with mature firms in the ecosystem. Called mature firms, these could be smallish, but stable, long-term constituents of the business community. Alternatively, mature firms are also large publicly-traded corporations as well. Large or mature firms have played a significant role in Israel, Silicon Valley, and Sophia Antipolis.

The mixing and recycling of talent amongst mature firms and venture firms produces knowledge spinoffs that benefit both parties. Established, mature businesses can mentor aspiring technology oriented entrepreneurs, help adapt business models, test technology, and improve and develop management practices. Innovating, fast-growing ventures can likewise improve the culture of mature businesses and provide innovations to their systems, processes and products.

Mature firms are described as established, secure, but not necessarily large, companies engaged in trade in the ecosystem's geographic proximity. Knowingly, or unknowingly, mature firms contribute to network ties by catalyzing the mobility of resources and hastening testing and commercializing processes.

They promote the dissemination of start-up know-how and business practices by what they offer by way of capital, how they support the innovation processes, their ranks that promote the frequent flow of people around and throughout the ecosystem, and enriching collaboration. Modest encouragement by mature companies can provide exceptional opportunities for developing founders, and very early-stage ventures benefit from close proximity to, and mentorship by, successful high growth firms.

Other supports that mature firms can offer formed part of the research are shown in the table.

Interventions for Mature Firms to Support Start-ups and Founders

1.	Conduct R&D by posing problems for solution by Entrepreneurial Firms by hosting open innovation invitations, competitions, or hackathons
2.	Test prototypes developed by Entrepreneurial Firms
3.	Lend engineering talent or other operational and process capabilities
4.	Donate administrative or logistic support such as boardrooms, offices, equipment, photocopiers, distribution capabilities
5.	Government policies that support in-kind contributions by Mature Firms
6.	Lend equipment, kit or resources that are difficult or expensive to acquire or purchase
7.	Donate office materials, furniture, or old equipment to accelerators, incubators or Start-ups
8.	As sources of high paid employment and stability, Mature Firms can release employees that are potential new innovators and entrepreneurs without encumbrances (Samsung, McCains, Emera, Louisburg Seafood)
9.	Accelerate Startup's commercialization by buying from or selling to Start-ups
10.	Introduce Start-ups to Mature Firm network -- suppliers, customers
11.	Provide introductions to network of industry associates
12.	Government spending/support into privately held firms contains a proviso to find ways to support the venture and entrepreneurial community
13.	Assist in rapid testing to accelerate validation
14.	Engage in customer trials
15.	Provide circumstances or logistics to assist Startups with field trials
16.	Help Start-ups identify key qualities needed for mission critical situations (i.e, document control procedures, advance assurance visits, quality consultations)
17.	Invite a Start-up to attend an industry conference with a Mature Firm employees
18.	Provide feedback for product market fit
19.	Test prototypes
20.	Emulate a customer; act like a customer so a Start-up can get the gist of the language, needs and conversation with a larger company
21.	Put an entrepreneur on the plane with your sales group, or your technical group. Let them test the market with your team or listen how to field customer concerns
22.	Make a meeting with a Mature Firm of your acquaintance and a Start-up you think could benefit

8. SEEK VENTURE CAPITAL OUTSIDE OF ATLANTIC REGION

Most of the knowledge-search activity with venture capitalists who reside outside of Atlantic Canada was undertaken by VCs in the region, not entrepreneurs. The little independent private venture capital in Atlantic Canada is buttressed by the significant outreach of the VCs who bring additional capital with syndication. Many of the local funds (not all) are government-sponsored venture capital attempting to fill financing gaps and fulfill government, or quasi-government, mandates. The mandate for some venture capital funds also includes supportive and mentoring capacity in the ecosystem, and to provide incubating opportunities. These related activities forestall specialization which in very small markets is unviable.

The nature of our marketplace puts the onus on entrepreneurs to spend more time where their markets are, with their customers, within sight of their competitors, and searching for future financing opportunities. It demonstrates a unique resourcefulness when founders reach out to venture capitalists outside of the region, perhaps to VCs specializing in their technology area. At the same time, founders who expose themselves to a broader financial audience further reveal their value propositions to their competition helping to validate their business models and to hone their competitive edge. As the quintessential hurdle to surmount, founders who spend time cultivating their capabilities and their technology outside the region will experience the advanced sophistication of validating value propositions and business models in the face of distant competitors. Co-founders making overtures to investors outside of the region will benefit from: a) an increased breadth of their specific knowledge of financing specialties (agtech, clean tech, pet tech, ICT specialist financiers, etc.), b) exposure to their competition, and c) helping to situate the region on the global entrepreneurial and innovation map.

9. IMPROVE ENGAGEMENT BETWEEN PEER-TO-PEER RELATIONSHIPS

Analysis of a sub-section of the data reveled that there was less peer-to-peer (founder-to-founder) outreach in the data. The major prevalence of outreach was, rather, for intelligence from supportive organizations, governments, financings, etc. This observation could be misinterpreted as mentoring. However, peer-to-peer relationships and peer-to-mentor relationships differ principally by the age and expertise of the mentor. Peer-to-peer relationships are more similar in age (generally younger in age and stage of development) and have fewer stage-of-development discrepancies between the pair. Successful founders support learning amongst themselves by taking a greater role in communicating, interacting, and supporting other founders. This is the collision that takes place in incubators and accelerators.

Mentors are usually older and further along in their careers than their pairing. Successful entrepreneurial mentors are potential tutors for entrepreneurs if they possess unique credibility and social influence as they are particularly high-status entrepreneurs. Their ability to introduce their mentee to financiers, senior resource holders, potential employees, and/or co-founders enhances the mentees social prestige by association. A previously successful entrepreneurial mentor will have more weight in recommending their mentees to intermediaries (such as venture capitalists) since a recommendation coming from a high-performing entrepreneur will carry more weight (with an investor) than the recommendation coming from someone else. Successful mentors often pre-screen potential mentees to ensure they are working with premium talent worthy of investing their own time.

10. BEST PRACTICES TO ADOPT SIMILAR RESEARCH

As different iterations of the survey dissemination occurred over time, the authors recognized that the use of the entrepreneurship and/or business development centres was a more direct and responsive vehicle to develop survey respondents. The entrepreneurship centres and business development centres have very close working relationships with their clients; in some cases that has resulted in databases of thousands of entrepreneurial clients they have worked with over the years and with whom they still maintain relationships. These relationships were more productive for the local survey administrator. Future replications of this work should cultivate research relationships with the region's universities' entrepreneurship centres (i.e. McCain Institute, SMU Entrepreneurship Centre, Genesis, etc.) in order to distribute surveys.

Contents

Context

Relationships are important. They are important because innovation does not exist in the air, and entrepreneurial opportunities do not appear out of nowhere. Relationships are important for innovations and entrepreneurial consequences as entrepreneurs forage for opportunities and to improve firm performance.

For successful, sustainable, long-term high employment entrepreneurship to take seed and flourish there must be innovation. This work seeks to assess that key driver of innovation, the search for knowledge, curiosity. Moreover, it places the key driver of knowledge-search, curiosity, amongst the various actors to who they reach out and situates them in amongst their relationships in what we now call an ecosystem.

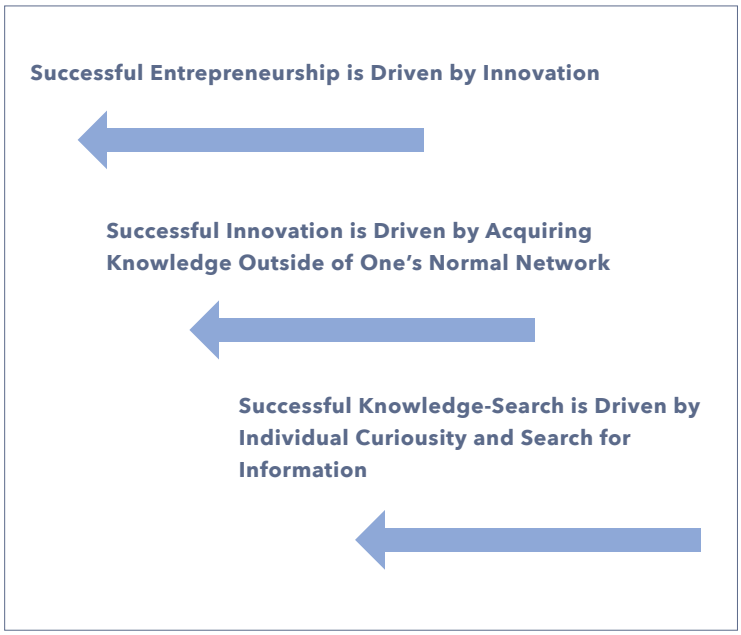
Entrepreneurs use relationships to acquire information. The knowledge sought by innovators and entrepreneurs is tracked and traded between economic actors via defined social networks. Indeed, many start-ups often begin with little more than the social networks of their founders. Resourceful entrepreneurs compensate for their lack of financial, market or industry assets by drawing on their family, social and professional networks. These networks provide them with access to information and resources without having to engage, or pay for it. Using the capabilities of people they know, and make a point of knowing, entrepreneurs parse out details, spawn ideas, obtain feedback, and solicit resources.

In locales where many entrepreneurs are situated, the notion of entrepreneurial ecosystems describes the network of ties and support systems that connect entrepreneurs to finance, professional services, information, support, technology, and to one another. Born out of the concept of industrial clusters and clusters of innovation, entrepreneurial ecosystems describe knowledge relations established amongst various constituents in an environment where many young firms are situated and innovation activities are hatched and nurtured.

In an ecosystem, those who are well-embedded with extended networks have improved innovation outcomes due to the facilitations and flows of knowledge through them. Deliberately placing themselves amongst a variety of clusters of relationships confers informational advantages upon those who are well-connected. Innovators develop superior ideas in discussion with others, combine ideas to create new business models, execute customer discovery, and help product-market fit concepts unfold.

The importance of entrepreneurial ecosystems is gaining currency as these purpose-driven networks have become recognized as accelerants for economic development opportunities, thus conferring regional advantage. Cultivating the university, government, incubation, finance, professional services, and culture around an ecosystem is a means to facilitating entrepreneurial opportunities which are powerful positive economic agents.

Figure 1 - How Curiosity Drives Successful Entrepreneurship



GENESIS *of the* RESEARCH

Understanding entrepreneurs' knowledge networks and entrepreneurial ecosystems has become a policy pursuit for governments interested in hastening economic outcomes that accompany such endeavours. In 2014, the Atlantic Entrepreneurial Ecosystem Project began the examination of innovation-seeking behaviours of the entrepreneurial constituents on Canada's east coast by examining who was looking to whom for what type of information. Investigating the knowledge acquisition of entrepreneurs and other ecosystem constituents in the region led to subsequent meaningful findings and propelled the research project onto an international stage.

The genesis of the relationship between Atlantic Policy Research Initiative began with an outreach event hosted by APRI and attended by Ellen Farrell, now Principal Investigator of the Atlantic Entrepreneurial Ecosystem Project. It was also fostered by ACOA's participation in a large conference sponsored by Saint Mary's University featuring the work of Dr. Farrell with participation from world-class scholars (David Audretsch and Benson Honig), policy organizations (ACOA and Industry Canada), significant entrepreneurial and educational bodies such as the Kauffmann Foundation (Dane Stangler), and well-known industry leaders (Gerry Pond).

A proposal to extend the original work begun by the Province of Nova Scotia and Industry Canada was made to APRI. The proposal suggested collecting data for AEEP using scholars from universities from around Atlantic Canada to enhance the sample's breadth and the potential participation of respondents.

The accepted proposal saw that:

- the resulting data would be made available to all scholars who participated in the research;
- that the Principal Investigator would assemble a team to turn the data into network maps;
- the maps would make the results visually interpretable for scholars and their communities,
- the PI's team would teach participating scholars and graduate and undergraduate students about network theory,
- this would help scholars communicate their results to their respective communities and cement their importance in the entrepreneurial ecosystems;
- participation in preparing papers about their findings would be encouraged, and
- knowledge mobilization for the work and Atlantic Canada would be disseminated on a world scale.

Project Participants

The scholars participating in the research span six universities and seven campuses. The students participating in the research included graduate and undergraduates. Three specialists in design, network visualization, and plotting were also key to the project's success. They are enumerated in the list below.

Ellen Farrell, PhD Principal Researcher
Professor, Sobey School of Business
Saint Mary's University
Halifax, Nova Scotia

Nathan Dennison, MBA, MA
ICT Sector Specialist, Nova Scotia Business Inc.
Halifax, Nova Scotia

Dannie Brown, DBA
Professor, Cape Breton University
Sydney, Nova Scotia

Izold Guihur, PhD
Professor, Department of Management, University of Moncton
Moncton, New Brunswick

Stephanie Gilbert, PhD
Assistant Professor, Cape Breton University
Sydney, Nova Scotia

Basu Sharma, PhD
Professor of Organization Studies, University of New Brunswick
Fredericton, New Brunswick

Kevin McKague, PhD
Associate Professor, Strategy/Entrepreneurship, Cape Breton University
Sydney, Nova Scotia

Nancy Mathis, PhD
Executive Director, Wallace McCain Institute
Fredericton, New Brunswick

Ken Carter, MPhil, MBA
Director, Office of Engagement, MUN
Corner Brook, Newfoundland

Blair Winsor, PhD
Assistant Professor, Entrepreneurship, Memorial University
Saint John's Newfoundland

Greg Baker
Research Instrument Technician,
Saint Mary's University
Halifax, Nova Scotia

Andrea MacDonald
Owner & Designer, Lupin Design Studio
Halifax, Nova Scotia

Student Researchers:

Jiaen Yu
SMU

Manish Shaw
CBU

Abhishek Dwivedi
UNB

Jill MacPherson
CBU

Ramandeep Singh
SMU

Kevin Therrien
UdeM

Pallav Parikh
SMU

Jennifer Harbin
SMU

Avinash Chandrapati
SMU

Dana Feltham
MUN

Sandra Cook
MUN

Alex Guest
MUN

David McCarthy
MUN

Methodology

Some actions pursued by entrepreneurs are designed to foster innovation, but not all opportunities pursued by entrepreneurs are innovative. Many entrepreneurs are me-too businesses, or lifestyle pursuits that are not distinctly innovative. The search for innovative information is one key to an effectively operating entrepreneurial ecosystems because the innovation builds a vibrant and successful undercurrent of entrepreneurship -- sustainable, viable, economic value-producing firms around which me-too businesses and lifestyle pursuit-type firms can build.

The purpose of this study was to investigate the curiosity of individuals who self-identify as being part of an informally defined entrepreneurial ecosystem. The work examined the knowledge-seeking behaviours of entrepreneurs and their willingness to reach out to other to collect information that would be useful to advancing their business interests. Founders and entrepreneurs were solicited to construct a comprehensive picture of their actions to find innovative information to support their entrepreneurial activities.

This work investigates entrepreneurial ecosystems in a more structured, quantitative manner than previous efforts at ecosystem research; it uses survey data and network theory. Importantly, the work heeds recent calls to introduce context to entrepreneurial ecosystem studies by avoiding focus on the firm or the entrepreneur [see 1]. Hence the foci are on building a picture of participants, and mapping their curiosity across the ecosystem in Atlantic Canada. These two qualities put this work in sharp contrast to other methodologies studying entrepreneurial ecosystems.

In the opportunity search literature, the central measure used to identify opportunity exploitation has been *actions that entrepreneurs take to form and exploit opportunities* [2 p 126]. The research here investigates the actions that actors take, their formal an informal methods to coalesce [3], to connect with others who might have some answers.

This work parses out those taking significant actions to find, develop and innovate for their businesses. It was reasoned that a) picking up the phone, or b) sending an email, or c) deliberately making an effort to meet or talk to someone about their businesses were actions that entrepreneurs engaged in to form and exploit innovative opportunities. Entrepreneurial behavior influences entrepreneurial innovation [1], so the action that entrepreneurs engage in to seek knowledge – satisfying their curiosity in a personal outreach (not surfing the Internet) – became the measure for an indicator for entrepreneurial innovation.

The research design used paper, pdf or website surveys to survey self-identified entrepreneurs about the curiosity-driven actions that took in the distant past. We asked respondents additional questions about the importance and frequency of the information the sought-after individuals pursued. The survey protocol was overseen by scholars from six different universities in order to take advantage of their local knowledge and their name recognition in the community. Returned surveys were automated and auto populated a prepared database, although a few people contributed hand written results.

Gephi, an open-source network theory program, was used to map the relationships of the respondents – what we call the ecosystem. Some people and organizations that were enumerated by several, or many, respondents became more obvious in the mapping process. The subsequent charts of various data sets provide a highly illustrative model of the Atlantic Entrepreneurial Ecosystem. The following section provides the details of the methodology concerning the measures, population, sample selection, data collection, and the survey descriptives.

MEASURES BASED *on the* ROLE *of* KNOWLEDGE-SEEKING *in an* ECOSYSTEM

In this study, knowledge-seeking behaviours were defined as actions taken by phone, in person or by email/text where a constituent of the ecosystem reached out to another individual in an effort to find information to make a decision related to an entrepreneurial firm. The source of the information sought was identified by their name and their organization.

The type of information sought was measured on three dimensions: the scientific or business nature of information sought, its importance to the entrepreneur, and the frequency with which the informant was sought. The types of information sought were assessed on two qualities: business information or technical information. Business was defined as either business/market/financial information, and technical information was defined as product/scientific/technical information. The number of times an ecosystem member reached out to someone and the importance of the information to the seeker were each measured with a seven-point Likert scale.

SAMPLE *Selection*

There is no list of all entrepreneurs or all entrepreneurial firms largely because there is no conventional definition of an entrepreneur. The definition of entrepreneurship varies from study to study and its methodological operationalization is equally varied.

1. For example, one good source defines entrepreneurial firms as all of those that are pre-IPO. WOW. That is broad, every privately held firm in the world.
2. Another definition accepts firms that are innovating (making them entrepreneurial even though they may not be small, or new, or recently founded). However, to know if a company is innovating would take many, many questions before we even got to the topic for discussion could be similarly difficult to tease out.
3. Firms that are rapidly growing is also a common descriptor; this of course would include some of the largest firms in the world of recent. To qualify a firm of growing rapidly we would have to ask considerable number of questions ... and know what kind of answers we would want. Would the rapid growth be financial growth, or would a growing number of employees be enough? Is it revenue or profit that is growing rapidly. What is rapid? What about a company that has received a lot of venture capital and is hiring, yet has no revenues; will that be considered to be growing rapidly? Thus, it is not surprising that a definition is not easily found.
4. Unicorns are a rapidly growing topic on Twitter, blogs and listservs.
5. Many firms are not young, nor start-ups anymore when they hit their stride, making them easily ignored when samples are being created.
6. Another accepted method to operationalize a sample is to use those who currently own or manage a young business [4]. Sampling from young businesses, however, does not respond to the broad notion that an entrepreneurial firm is a firm that is innovating, or growing rapidly. By the way, how young is young?
7. Some might be happy to survey technology entrepreneurs, not traditional entrepreneurs. (The definitions of these two groups are different than most would assume. The qualities that define the technology entrepreneurs are discussed in Questions Raised by the Research. The successful traditional entrepreneurs build revenues and employees and pay taxes. The technology entrepreneurs are defined by the sale of their innovations exclusive of revenues or employees and profit from capital gains.) Even if those were the desired qualities in a sample, the introduction of computer technology to every sector blurs the line between so-called technology and traditional entrepreneurs.

The reality is that trying to narrowly focus the definition of a sample by specific qualifications risks losing much of the picture -- especially in a an entrepreneurial ecosystem – particularly one that draw on a large geography with a small population. Are we describing an ecosystem, or are we looking for a specific population? Nonetheless, the research completed here is based on innovation-outreach which puts the results squarely in the wheelhouse of an innovation and high-growth orientation entrepreneur. The development of samples leaned heavily in that direction (scouring Entrevestor, Entrepreneurship Centres, rolodexes of faculty, etc.)

The research adopted a constructivist approach with a sampling method that describes and explains, and yet allows entrepreneurs to self-identify. It acknowledges the personal impressions of respondents -- of themselves as entrepreneurs -- regardless of the time of founding, type, founder status, revenues, growth rate, number of employees, amount of finance, pre-revenue or revenue status of their businesses. For emerging quantitative research work such as this, it allows for interpreting data, and studying the ecosystem participant setting and context -- not prescribing it. The newness of the ecosystem research in the literature demands a more constructive study to begin to understand the actors, the context, their relationships, and their roles in the ecosystem.

Moreover, using a broad perspective of entrepreneurship also allows the potential for more varied types of analysis as the knowledge-seeking actions of different cohorts are compared or contrasted, such as the knowledge-search by start-ups compared to companies that are entrepreneurial but not new, tech start-ups of older founders with very young founders; or high growth start-ups differences with more lifestyle-type entrepreneurs.

The samples were composed in each of the regional locales by the scholars and their resources: Halifax, Sydney, Charlottetown, Corner Brook, St. John's , Moncton, Fredericton. In creating samples, a number of well-known studies have used a variety of complementary methods that cast a wide net. Adopting a compilation of these approaches, samples of those who currently own or manage an entrepreneurial business were drawn from a variety of sources including:

- Collating personal contacts of the lead researchers (i.e. Parker and van Praag 2006; Lee and Marvel 2014);
- Regional development authorities (i.e. Conseil Economic Noveau Brunswick) (i.e. Ayala and GManzano 2014);
- Rural development authorities (Rural and Regional Development PEI) (i.e. Stefan 2014);
- Firm names drawn from media sources such as Entrevestor.com (an entrepreneurial news service), AllNovaScotia.com and AllNewfoundland.com (business news services);
- Online networking sites such LinkedIn;
- Colleagues from universities and venture capital funds;
- Government and incubation organizations such as Planet Hatch, Genesis Centre, Volta;
- Local entrepreneurs' on-line support groups on FaceBook (Corner Brook);
- Respondent-driven sampling (Biernacki, 1981); and
- an entrepreneurship Blitz! in cooperation with ACOA and CBU to meet entrepreneurs and promote the upcoming survey distribution (Cape Breton).

---

[1]Respondent-driven sampling, is appropriate for network analysis (Biernacki, 1981) where respondents indicate persons from whom they sought advice/information/knowledge about entrepreneurial ventures. The individuals noted by respondents become the source for survey distribution, enlarging the sample and developing new potential respondents. Using this method, it is possible to access hidden agents participating within the entrepreneurial ecosystem. It is also recognized that some influencers will not be part of the sample.

Cape Breton University, in conjunction with local ACOA representatives and Cape Breton University, held a Data Blitz to generate excitement about the work and Cape Breton's participation. Media promoted the event, and scholars, support organizations and students were prominent in the community to help entrepreneurs fill out their surveys.

DATA COLLECTION *and* CODING

Most surveys were addressed to respondents under the email of the lead scholar in the area. Email survey distribution was adopted to avoid data collection services and to take advantage of name recognition. Services such as Survey Monkey were avoided to ensure that the process of exporting data from the surveys occurred on servers owned, and operated, by the various local universities as opposed to an independent third party. By ensuring that this data was only retained by the universities (principally SMU) we were able to better ensure the confidentiality of all personal information collected. 2. Email distribution takes advantage of the local scholar's name recognition and adds academic credibility to the requests. Responses were in shorter supply when the key scholar's email address was not used.

The survey protocol was executed by means of a 'fillable form' survey, or a web-based survey later in the data-collection phase, to accommodate respondents who preferred mobile use. The data obtained in pdf fillable forms or via a dedicated link to a website and was exported to .csv files. The process was automated so information provided by either method populated the database automatically. Cleaning and coding the data was paramount to ensure that a single organization were not represented by several different nodes. The Genesis Centre, and Genesis Center, and Genesis MUN and GC at Memorial would otherwise appear as four separate nodes if an observer did not code them all as one node.

Analysis was completed using the complex network theory program, Gephi [5]. Table 1 below shows the manner of coding such data. For example, Jane Smith responded to the survey and is coded as Agent 1. She reported reaching out to three people who are coded as Agent 2, 3, and 4. The weights and frequencies and types of communications requested are surveyed also coded. Later on, if John Doe (Agent 43) mentions Jane Smith, we already have her coded as Agent 1.

Table 1 - Example of Network Theory Coding

Source	Target	Weight (1-7)	Frequency (#/Year)	Type of Communication
Agent 1	Agent 2	6	30	Business/Market/Financial
Agent 1	Agent 3	2	10	Both
Agent 1	Agent 4	1	1	Neither
Agent 1	Agent 5	7	100	Product/Service/Technical
Agent 43	Agent 1	6	2	Product/Service/Technical

SURVEY *Descriptives*

This sub-section looks at the distribution of the respondents from the various locales, their gender, their age, and their self-identification of the respondents' professions. Table 2 – Surveys Respondents By Data Collection Locale describes the responses from the various locales named by the university participating. The total number of respondents was 553.

Table 2 – Survey Respondents By Data Collection Locale

Data Collection Locale	#	% of total
MUN-CB	51	9.2
MUN-SJ	105	19.0
CBU	72	13.0
UPEI	83	15.0
UdeM	83	15.0
UNB	137	24.8
SMU	79	14.3
Total Completed Surveys	553	100

Of the 533 individuals responding to the survey, 150 (28.1 percent) were female and 368 (69.0%) were male. Fifteen people declined to disclose their gender. The bulk of the respondents were between 26 and 65. Aged 26-35 were 24 percent of the respondents, 26.6 percent of the respondents were aged 36-45, and 38.5 percent of respondents were aged 45 – 65. An oversight in the age categories combined (in error) the 46-55 and 56-65 categories making it now impossible to distinguish between the two categories. In making a supposition that age category 46-55 was 28.0 percent of the total, age 56-65 would be 10.5 percent remaining.

Table 3 –Gender and Age of Respondents by Data Collection Locale

	GENDER				AGE						
	Male	Female	DND	Total	18-25	26-35	36-45	46-65	66+	DND	Total
MUN Corner Brook	39	11	1	51	7	11	6	24	0	3	51
MUN St. John's	74	31	0	105	1	29	15	49	2	9	105
CBU	43	23	0	66	3	19	21	16	7	0	66
SMU	47	16	5	68	3	16	19	26	1	3	68
UPEI	50	27	3	80	5	22	25	27	1	0	80
UdeM	20	6	0	26	2	6	10	8	0	0	26
UNB	95	36	6	137	0	26	46	55	6	4	137
Total (#)	368	150	15	533	21	129	142	205	17	19	533
% Of Respondents	69.0	28.1	2.8	100.0	3.9	24.2	26.6	38.5	3.2	3.6	100.0

The nature of the respondents' capacities within the ecosystem is the subject of Table 4. Respondents were permitted to self-identify into more than one category. Most of the respondents were entrepreneurs (47.9%), social entrepreneurs (7.0%) and a class of individuals who reported themselves as consultants (11.7%). As a collection, the next largest group were private individual investors (5.0%), and government representatives (5.1%).

The nature of the respondents' capacities within the ecosystem is the subject of Table 4. Respondents were permitted to self-identify into more than one category. Most of the respondents were entrepreneurs (47.9%), social entrepreneurs (7.0%) and a class of individuals who reported themselves as consultants (11.7%). As a collection, the next largest group were private individual investors (5.0%), and government representatives (5.1%).

Table 4 – Self Identification of Profession & Aboriginal Status (More Than One Category Possible)

	Entrepreneur	Social Entrepreneur	Aboriginal	Venture Capitalist	Private Individual Investor	Member of a Business Angel Network	Lawyer	Accountant	Government Representative	Consultant	Journalist	Professor	Employee in a Mature Company	Research Laboratory Employee	Banker	Other
MUN-CB	28	8	8	0	3	3	1	3	13	2	2	6	3	1	0	9
MUN-SJ	52	12	1	6	5	2	3	5	20	16	1	6	9	2	0	14
CBU	59	10	4	2	4	1	0	1	2	4	0	1	4	0	0	14
UPEI	74	9	1	0	5	0	0	1	1	13	2	2	4	1	0	1
UdeM	23	0	0	0	0	1	0	1	0	0	0	1	1	0	0	3
UNB	121	19	0	1	16	3	1	2	3	32	0	6	10	1	0	8
SMU	37	0	0	12	8	1	1	0	3	29	0	10	1	0	1	3
TOTAL	394	58	14	21	41	11	6	13	42	96	5	32	32	5	1	52
% of whole	47.9	7.0	1.7	2.6	5.0	1.3	0.7	1.6	5.1	11.7	0.6	3.9	3.9	0.6	0.1	6.3

The previously-held notion that entrepreneurship is a field for those who are not highly educated has been dispelled of recent, and is confirmed in Table 5. Respondents were highly educated with almost 85 percent having some higher education. Of the total, 33.3 percent had a bachelor's degree; 17.8 percent had a master or professional degree; 14.7 percent had some college or vocational school; and 5.4 percent of the survey participants a doctoral degree.

Table 5 – Education by Locale

	High school or equivalent (#)	Some college (#)	Vocation/technical school (2 year)(#)	Bachelor degree (#)	Master degree (#)	Professional degree (MD, JD, etc.)(#)	Doctoral degree (#)	Other (#)
MUN-CB	12	6	7	23	12	4	3	7
MUN-SJ	16	5	7	59	26	10	11	8
CBU	16	14	11	31	18	3	2	4
UPEI	20	9	12	45	15	5	2	8
UdeM	8	1	3	9	10	10	1	1
UNB	41	13	22	65	31	16	14	8
SMU	2	0	2	22	34	11	8	0
TOTAL	115	48	64	254	146	59	41	36
% of whole	15.1	6.3	8.4	33.3	10.1	7.7	5.4	4.7

ANALYSIS

The analysis presents and highlights the data from a variety of perspectives as the basis for a number of findings in the next section. The concepts of node size angd the centrality of the nodes are discussed next to help inform readers of the context of the illustrations they will view. Following that, illustrations – charts – of each data collection locale are presented that demonstrate the various players in the ecosystem (nodes) and the types of information they sought (colours of the edge lines). Each data collection locale chart is accompanied by a table which highlights the largest nodes, the top-requested constituent organizations of each locale.

NODE SIZE AND CENTRALITY

Every organization reported by respondents and including respondents is represented by a node, a small circle which is colour-coded for the type of constituent group to which it belongs (university, government, entrepreneur, etc.). There are 1666 nodes identified in the Atlantic Entrepreneurial Ecosystem.

The size of an organization's node reflects the number of times that they were *sought after for information* by participants in the ecosystem and the value of the information sought. Therefore a node can only be large if other ecosystem participants mention it a lot. The size of a node cannot be influenced by the organization itself. The size of a node is not influenced by the number of surveys that employees of the firm might have contributed. Hence, the size of an organization's node is not influenced by their own out-bound information-seeking activity, but rather by the amount of information-seeking activity that was *sought of them.*

For example, even though Build Ventures is a large node, in this case Build Ventures is large because many organizations sought much information from the venture capital fund and found the information to be valuable.

The centrality of a node is a measure of its interconnectedness to the rest of the ecosystem. Centrality occurs because of many requests for information are sought of an organization from a *variety* of other organizations in the ecosystem. Alternatively centrality can occur from much outbound connectivity as well – where an organization is connected to many other firms. For example, an entrepreneurial firm like NewPace is very central because they reached out for information from dozens of different organizations so they are very connected for information and are thus central. Their node, however, is rather small because NewPace was not a source of information from a large number of other firms.

Following are the charts of each of the locales from which the surveys were distributed. Each chart illustrates the various nodes, and the percentage of nodes they represent by the distinct groups of: firms, venture capital, professionals, governments, financial institutions, and support organizations. Each chart also has a legend which identifies the percentage of information sought (edges) as well. The information sought is comprised of two categories business/market/ financial information signifying businesses look for information on how to run a business, or new business models. The other major type of information sought is technical/product/scientific signifying information sought about developing products and innovating the products and firm capabilities.

> The first time this research was presented for an audience, an audible gasp was heard in the room. Struck by the graphic intuitiveness of the work, attendees of the Financing Knowledge Transfer Conference, sponsored by the European Investment Bank and the Italian Ministry of Education, recognized immediately the potential for this kind of work for knowledge-search and deriving policy findings.

ATLANTIC ENTREPRENEURIAL *Ecosystem*

This section proceeds with a discussion of the ecosystem participants that are represented as colourful nodes on the charts, and the types of information sought by them. The sub-sections that follow include: the AEE, and then the composite is broken into it data collection locales in order of New Brunswick data from UNB's McCain Institute and the UdeM, Newfoundland from Memorial University's Corner Brook and St. John's campuses; Nova Scotia data from CBU and SMU, and Prince Edward Island data from UPEI.

In print form, the charts will give a hint at the complexity of the ecosystem, but they will be too small to do more than that. If you have a copy of this report in its digital pdf form, you can enlarge the pages and see the detail in every node and edge.

The largest nodes on the charts are those that were sought after by many, and the value of the information to respondents. Each network chart and its description is followed by a table ranking the nodes them by degree centrality.

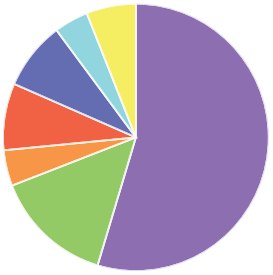
FIGURE 2 – AEE KNOWLEDGE-SEEKING ACTIONS

On this this chart, the knowledge-seeking actions amongst all of the respondents to the Atlantic Entrepreneurial Ecosystem surveys are shown. The breadth of our reach across the world is clear, extending well beyond the Atlantic Region.

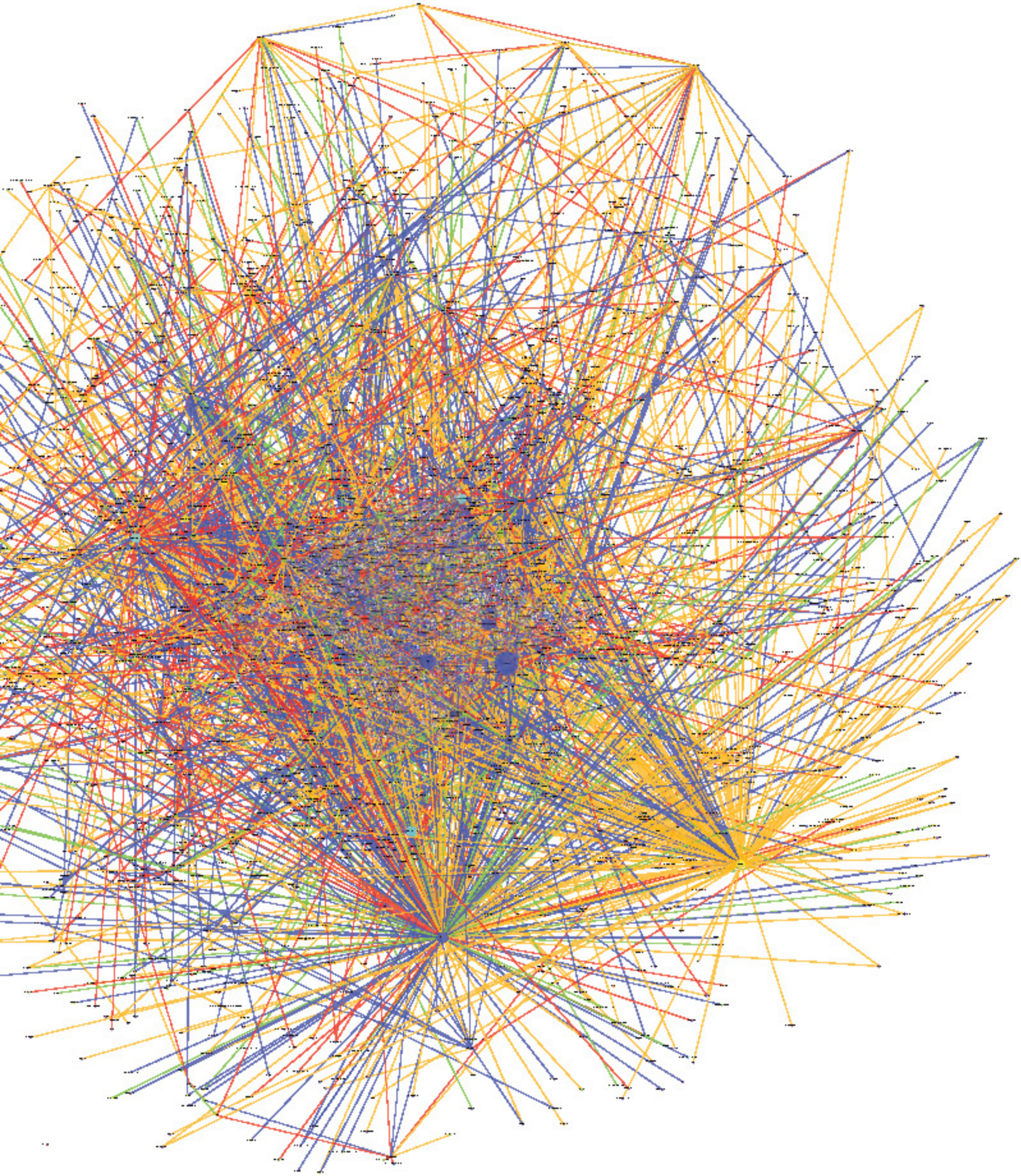
1666 *nodes*

3397 *edges*

- Entrepreneurial Firm: 55%
- Support Organization: 17%
- Venture Capital/Angel Network: 6%
- Financial Institution: 4%
- University/College/Research: 3%
- Accounting/Law Firm: 8%
- Government Agency: 7%



- Product/Service/Technical:
- Business/Market/Financial: 45%
- Both: 33%
- Neither: 7%



The composite of the Atlantic Entrepreneurial Ecosystem displays 1666 nodes and 3397 reported searches for information. While it would seem nice to have every member of the ecosystem reporting, one can see that the increasing complexity of the illustration would further add little value.

Table 6 – Centrality of Atlantic Entrepreneurial Ecosystem Knowledge-Seeking Actions (Ranked by Degree)

Id	Indegree	Outdegree	Degree	Weighted Indegree	Weighted Outdegree	Weighted Degree
Innovacorp	38	283	321	314	2536	2850
Build Ventures	28	180	208	215	968	1183
ACOA-APECA	122	63	185	734	416	1150
Memorial University	42	65	107	276	423	699
Saint Mary's University	25	76	101	239	316	555
NSBI	28	60	88	195	400	595
RBC	56	25	81	290	117	407
BDC	73	0	73	467	0	467
NLOWE	25	39	64	126	188	314
Futurpreneur	33	28	61	183	130	313
National Research Council (NRC)	59	0	59	341	0	341
Debenti	1	56	57	6	309	315
Wallace McCain Institute	16	40	56	41	208	249
GrowthWorks Atlantic	16	35	51	129	276	405
Government of NL - TCII	29	17	46	160	93	253
College of the North Atlantic	13	30	43	59	179	238
Aramax IP Services	2	41	43	6	352	358
Enterprise Saint John	5	38	43	16	212	228
Startup NL	17	24	41	74	111	185
CBDC	37	0	37	165	0	165
St. John's Board of Trade	10	26	36	53	136	189
Craft Alliance Atlantic Association	1	35	36	7	216	223
Springboard Atlantic	14	22	36	74	129	203
Common Ground Coworking	12	24	36	57	148	205
Propel ICT	34	2	36	150	2	152

NEW BRUNSWICK

Network analyses provides an overview of the people, organizations, importance, frequency and type of information sought by respondents to the survey. Figures 3 and 4, from UNB and UdeM respectively, demonstrate the knowledge-seeking activities of entrepreneurial respondents who identify the people and groups they reached out to for information. The nodes that ultimately form the chart are those people who responded to the survey and those that they mentioned. Often these overlap.

Respondents did not select from responses from a drop-down menu of prescribed organizations; rather respondents freely discuss the details of those people who were important to their business activities. There is no pre-determined list of provincial or regional agencies, VCs, banks, universities, support groups, professionals, etc. that are "suggested" to respondents. A paper version of the survey is an appendix to this document.

From the NB UNB data, Figure 3, entrepreneurial and mature firms represent 51 percent of the 396 nodes. Many members of the Atlantic Entrepreneurial Ecosystem would be able to tell from their labels, which firms were entrepreneurial and which were mature. Support organizations denote 14 percent of the nodes – 55 different organizations. Support organizations include, incubators, accelerators, and supporters such Planet Hatch, Springboard Atlantic, Futurepreneur, Start-up Zone, Bio NB and other similar organizations – some privately operated and others publicly funded. The venture capital funds and business angels (3%) and financial institutions (4%) constitute a combined seven percent of the nodes. Universities, colleges and research organizations are five percent. Professional firms and governments represent 11 percent and 12 percent of the nodes respectively.

Nearly half of all information sought (46%) was in the category of business/market/financial. The requests for information solely related to product/service/technical information comprised 24 percent of the requests. Another 28 percent for respondents were seeking information in both categories.

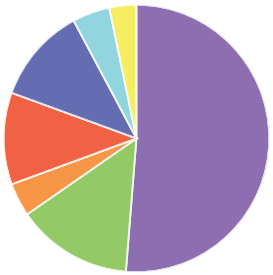
The centrality for the charts in Figures 3 and 4 represents the total number of different interactions to which a node was exposed. The more different nodes it is connected to, the more central it will appear in the charts. Recall, that the centrality of the node has no bearing on its size; a very small node (someone who sought a lot of information, but who was not sought after) can be very central because they were connected to many other nodes. For example, Smarter Spaces is a very central node (situated between BDC and UNB) because they are connected to 13 different organizations. But they are a very small node because no one sought information from them. Rankings of the most central nodes (by degree -- the number of inbound and outbound knowledge-seeking actions) appear in Table 7.

FIGURE 3 –NEW BRUNSWICK KNOWLEDGE-SEEKING ACTIONS COLLECTED AT UNB AND MCCAIN INSTITUTE

396 *nodes* **504** *edges*

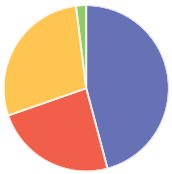
NODES

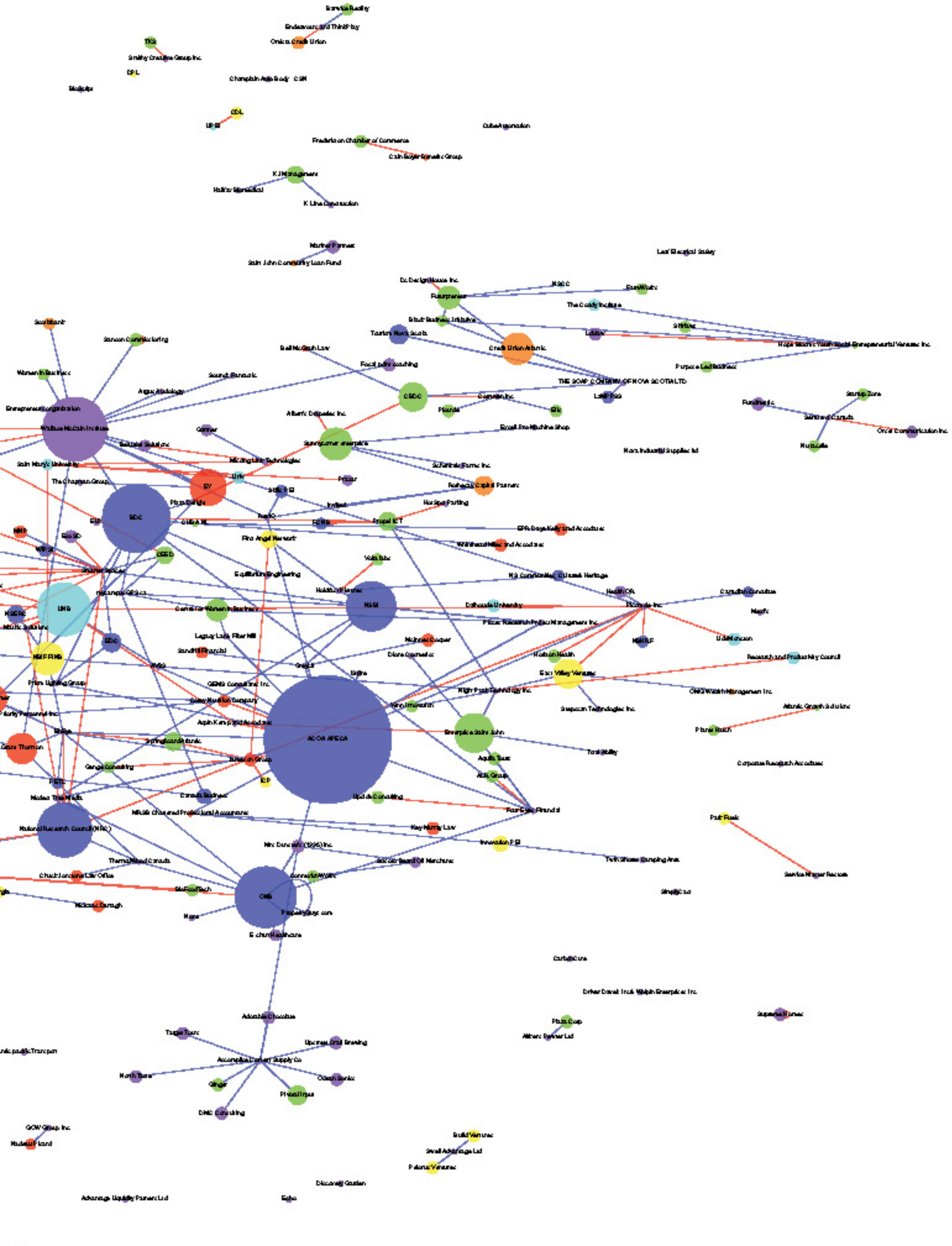
- Entrepreneurial Firm: 51%
- Support Organization: 14%
- Venture Capital/Angel Network: 3%
- Financial Institution: 4%
- University/College/Research: 5%
- Accounting/Law Firm: 11%
- Government Agency: 12%



EDGES

- Product/Service/Technical: 24%
- Business/Market/Financial: 46%
- Both: 28%
- Neither: 2%




Service Reality
Endeavours and ThinkPlay
Oniks Credit Union
TKS
Smiley Creative Group Inc.
DPL
Champlain Arts Body CSN
Studio Ps
CDL
UPEI
Cube Innovation
Fredericton Chamber of Commerce
Colin Boyer Dynamic Group
KJ Management
Halifax Specialist
K Line Corporation
Mother Parrot
Saint John Community Loan Fund
Last Escalpel Sisley
Ec Design House Inc.
Entrepreneur
NSCC
EuroWorks
The Coady Institute
Scotiabank
Black Business Initiative
Tourism Nova Scotia
Credit Union Atlantic
Lobster
Shiftkey
Hope Blooms Youth Social Entrepreneurial Ventures Inc.
Stanton Consultancy
Ball McGrath Law
Purpose Led Business
Women in Business
Sound Economic
Argyle Andrology
THE SOAP COMPANY OF NOVA SCOTIA LTD.
Energy Pod
Entrepreneurship organization
CEDC
Clarendon Inc.
Pfizer
Elic
Fundrise Inc.
Startup Zone
Sentinel Consult
Orca Communication Inc.
Nurocalla
Wallace McCain Institute
Albatic Detective Inc.
Gartner
Summercorner enterprise
Excell Fine Machine Shop
Mars Industrial Supplies ltd
Business Solutions
Saint Mary's University
Mining Link Technologies
The Chapman Group
SV
Link
Pfizer
SchoolMatic Forms Inc.
Rothesay Capital Partners
Pizza Delight
SBC
Instinct
Horizon Printing
Propel ICT
EPA Boyce Kelly and Accounting
Pine Angel Harvest
Whitehead Hilton and Accounting
Volta Inc.
Equilibrium Engineering
Holistic Pharma
MSH
Health CA
Canadian Conscious
Dalhousie University
Pfizer Research Project Management Inc.
Magic
UNB
Friends for Women in Business
Legacy Lake Fiber Hill
Michael Cooper
Diane Cosmetics
MSH R.F
Research and Productivity Council
Prism Lighting Group
Hudson Health
Eden Valley Ventures
Child Watch Management Inc.
High Point Technology Inc.
Stepscan Technologies Inc.
Atlantic Growth Solutions
Pfizer Hatch
Corporate Research Accounting
Aspin Kemp and Associates
ACOA APECA
Enterprise Saint John
Tent Valley
Agile Tour
ALS Group
Consult Sadnec
Updata Consulting
Point East Financial
Key Murray Law
Innovation PEI
Twin Shores Camping Area
Service Nigeer Racism
Thomas Wood Consult
Church Lane Law Office
Connect to Work
Single Cue
Nicholas Borough
Hope
Property Guys.com
Echuri Healthcare
Curbside Cure
Driver Donat Incs Ribbin Enterprise Inc.
Adorable Chocolate
Triple Tours
Upcrew Grill Brewing
Accomplish Content Supply Co.
North Bank
Ginger
Ocean Sonic
Physical Input
DMC Consulting
GOW Group Inc.
Build Ventures
Small Advantage Ltd
Polaris Ventures
Discovery Garden
Advantage Liquidity Partners Ltd
Echo

As the data was being analyzed, a community engagement event was held at Crandall University to introduce opinion leaders to the work and some of its preliminary findings. Attendees included Chambers of Commerce, EY, economic development organizations, University of Moncton, Opportunities NB, Town of Dieppe, Lead Startup Fredericton, and a member of the Legislative Assembly amongst numerous others.

Table 7 – Centrality in UNB/McCain Institute Data (Ranked by Degree)

Id	Indegree	Outdegree	Degree	Weighted Indegree	Weighted Outdegree	Weighted Degree
ACOA-APECA	17	0	17	127	0	127
Wallace McCain Institute	10	6	16	61	45	106
Smarter Spaces	0	14	14	0	90	90
ONB	9	2	11	58	12	70
Picomole Inc.	0	11	11	0	68	68
BDC	10	0	10	65	0	65
EhEye	0	9	9	0	54	54
Accomplice Content Supply Co.	0	9	9	0	70	70
National Research Council (NRC)	8	0	8	51	0	51
UNB	6	1	7	50	6	56
Four Eyes Financial	0	7	7	0	48	48
NSBI	6	0	6	46	0	46
Jameson Group	1	5	6	7	28	35
Ray Agency	0	6	6	0	37	37
Anointment Natural Skin Care Inc.	0	6	6	0	36	36
Night Puck Technology Inc.	0	6	6	0	45	45
Grant Thornton	5	0	5	26	0	26
NBIF-FINB	5	0	5	28	0	28
Enterprise Saint John	5	0	5	35	0	35
Futurpreneur	3	2	5	18	12	30
mycampusGPS.ca	0	5	5	0	25	25
Pivotal Coaching Inc.	0	5	5	0	31	31
Mathis Solutions	0	5	5	0	43	43
Hope Blooms Youth Social Entrepreneurial Ventures Inc.	0	5	5	0	30	30
East Valley Ventures	4	0	4	25	0	25

The results from the University of Moncton follow. From the 151 nodes on the UdeM charts, 34 percent of them are firms, principally entrepreneurial. Many support organizations were represented in the data at 22 percent of the nodes (more than 30 different organizations). Venture capital and financial organizations combined to make up eight percent of the nodes, and the university category had seven percent of the nodes (including UQAM, McKenzie College, UNB, Moncton High School, CCNB, amongst others). As observed in other charts, the professional services and government departments and agencies representa a considerable number of nodes respectively at 14 percent each.

The types of information sought were slightly dominated by product/service/technical with a combined total of 73 percent (28%+45%) followed by business/market/financial information slightly lagging at 68 percent of requests (23%+45%)

Table 8 – Centrality of UdeM Data (Ranked by Degree)

Id	Indegree	Outdegree	Degree	Weighted Indegree	Weighted Outdegree	Weighted Degree
Zone Mixte	6	24	30	34	124	158
Vidcruiter	0	21	21	0	124	124
Icube Media	1	18	19	6	82	88
MLT Missing Link Technologies	0	17	17	0	90	90
Spirit@Heart	1	15	16	6	78	84
Productions du Milieu	2	13	15	10	72	82
EduCode	0	14	14	0	72	72
UdeMoncton	13	0	13	108	0	108
Studio Tandem	0	13	13	0	53	53
GEMS Consultants Inc.	1	12	13	6	78	84
Solutions Galore	1	11	12	6	71	77
3 Plus	5	7	12	20	47	67
Grads Finders	0	12	12	0	78	78
Segue Films inc.	0	11	11	0	59	59
Peach marketing	0	10	10	0	55	55
Comptabilite NDR	1	9	10	7	56	63
Productions l'entrepot	1	8	9	5	48	53
Prelam	1	8	9	7	54	61
ACOA-APECA	8	0	8	42	0	42
CBDC	8	0	8	38	0	38
ONB	8	0	8	44	0	44
CPA Business consultant	6	0	6	34	0	34
Venn Innovation	6	0	6	28	0	28
Janin Traduction	1	5	6	5	21	26
CCNB	6	0	6	30	0	30

The centrality of the U de Moncton data is nicely disbursed. There are small nodes in the very centre of the chart that represent firms that reached out to many organizations to support their companies and interest. Likewise, there are a number of larger nodes hovering around the periphery indicating that the significant knowledge-search requested of them was from nodes that are not so central.

FIGURE 4 – UNIVERSITÉ DE MONCTON

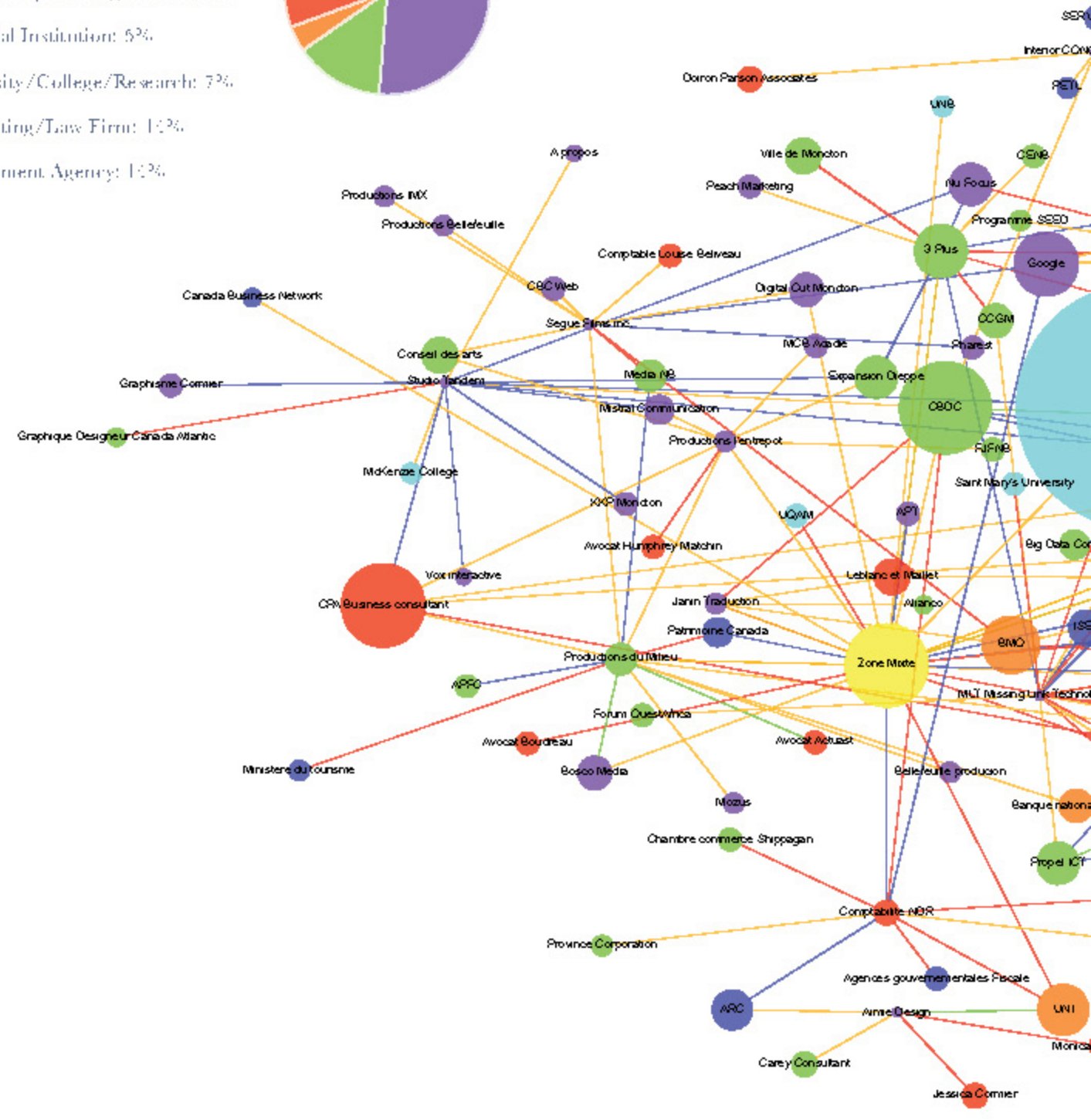
151 *nodes* 250 *edges*

NODES

- Entrepreneurial Firm: 34%
- Support Organization: 22%
- Venture Capital/Angel Network: 3%
- Financial Institution: 6%
- University/College/Research: 7%
- Accounting/Law Firm: 14%
- Government Agency: 14%

EDGES

- Product/Service/Technical: 26%
- Business/Market/Financial: 23%
- Both: 15%
- Neither: 2%



NEWFOUNDLAND *and* LABRADOR

The survey work at Memorial University was launched out of the main St. John's campus of MUN as well as the Grenville campus in Corner Brook by Dr. Blair Winsor and Ken Carter respectively. Particularly active as a research group, Memorial and Grenfell in particular also hosted associated workshops about network theory for the scholars involved, a conference based on the early work for participants and government from across NL, reports for the Harris Institute and lively, invigorating community engagements in Corner Brook.

The firms represent 44 percent of the nodes of the 330 nodes in the Newfoundland ecosystem which includes both Corner Brook and the St. John's data collection sites. These are largely entrepreneurial but there a few mature firms noted. The support organizations denote 19 percent of the nodes. The ranking of the nodes for support organizations (after the entrepreneurial firms) is consistent throughout the various data collection locales. Venture capital and financial institutions share 10 percent of the nodes equally (5% each). Interestingly, the nodes signified as professionals (13%) exceed the number of nodes for finance. Nine percent of the nodes represent government departments and agencies ranging from the Deer Lake Airport Authority to NL Business,Tourism, Culture and Rural Development.

In Newfoundland, 43 percent of requests for information (14% + 29% = 43%) were for product/service/technical types of information, and business/market/financial information were sought in 78 percent of the occasions (47% + 29% = 78%).

The centrality of the Newfoundland chart is somewhat distributed; it is not composed of a small group of nodes engaged in the centre. This is partly because the Grenfell Campus (Corner Brook) data was combined with the St. John's survey data. Organizations that are servicing clients from both locations and therefore have many references are more central, and others gravitate out slightly.

The Harris Centre in St. John's held a conference titled "People, Places and Public Engagement" was partially motivated by this work. Blair Winsor and Ken Carter outlined the work done from the Corner Brook and St. John's sites to an audience of 30 academics, government, industry and community attending the conference.

In Corner Brook, a community engagement and information session was held for corporate, university and municipal and provincial government leaders as the preliminary results were unfolding. This event attracted 26 people who reviewed the survey and considered the implications at that time. This event continues to spart interest in Corner Brook and some of the major manufacturers there.

Table 9 – Newfoundland Centrality (ranked by degree)

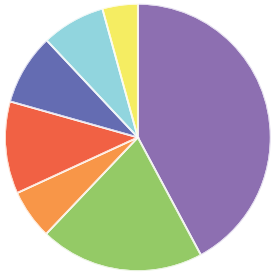
Id	Indegree	Outdegree	Degree	Weighted Indegree	Weighted Outdegree	Weighted Degree
ACOA-APECA	37	17	54	226	114	340
NLOWE	15	37	52	81	195	276
Memorial University	22	28	50	153	198	351
Startup NL	15	27	42	62	123	185
Futurpreneur	17	25	42	83	133	216
Sentinel Alert	0	37	37	0	203	203
Common Ground Coworking	10	25	35	48	158	206
BDC	33	0	33	194	0	194
St. John's Board of Trade	6	26	32	33	136	169
Genesis Centre	14	17	31	71	109	180
Wallace McCain Institute	1	25	26	5	131	136
Feaver's Lane Enterprises Inc.	0	25	25	0	100	100
Humber Valley Entrepreneurs	0	23	23	0	123	123
Reflective Marketing	1	21	22	7	106	113
RBC	22	0	22	127	0	127
A1 Saftey	0	22	22	0	117	117
Qalipu First Nation	4	17	21	15	100	115
Government of NL, Business, Tourism, Culture and Rural Development	15	5	20	82	17	99
NATI	3	15	18	13	97	110
Avalon Holographics, Inc	1	16	17	7	85	92
City of Corner Brook	0	17	17	0	107	107
Optimized Insurance	1	15	16	6	97	103
Pelorus Ventures	12	4	16	78	25	103
RDC	16	0	16	80	0	80
Killick Capital	15	0	15	97	0	97

FIGURE 5 – NEWFOUNDLAND AND LABRADOR
(Data from St. John's and Corner Brook campuses of MUN)

330 *nodes* **789** *edges*

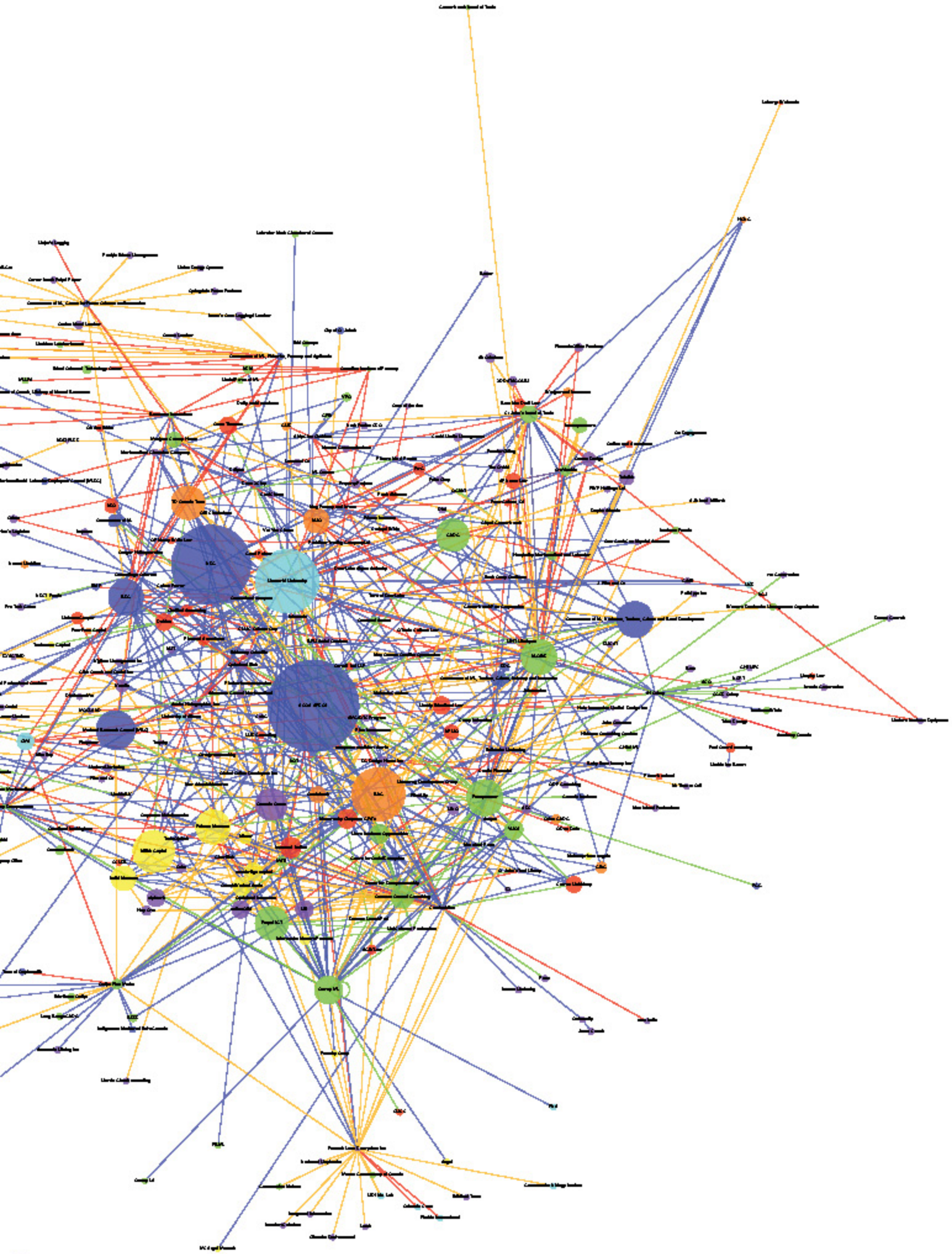
NODES

- Entrepreneurial Firm: 44%
- Support Organization: 19%
- Venture Capital/Angel Network: 5%
- Financial Institution: 5%
- University/College/Research: 5%
- Accounting/Law Firm: 13%
- Government Agency: 9%



EDGES

- Product/Service/Technical: 14%
- Business/Market/Financial: 47%
- Both: 29%
- Neither: 10%



PRINCE EDWARD ISLAND

Respondents to the UPEI survey administered under Dr. Susan Graham resulted in 59 percent of the nodes being firms. Dr. Graham drew on her background in economic development to help construct a range of organizations that could help prepare a population database to survey. Similar to the bigger picture overall, the support organizations demarked 16 percent of the Provinces nodes. Venture capitalists (2%) took a back seat to the financial institutions (8%) when ventures and other industry players were reaching out for information. Three or four universities/colleges were noted representing two percent of the nodes. Professional organizations were the designation for nine percent of the nodes and governments occupied four percent of the nodes.

The large bulk of the information requested was for business/market/financial concerns (60% + 16% = 76%) compared to product/service/technical information (18% + 16% 34%).

The density of the centrality is less noticeable in this chart, compared to some others, indicating a more diversified range of organizations from which respondents selected to search for innovation-type information.

In Charlottetown, representatives of the Chamber, venture capital, UPEI, ACOA, Bioscience Incubator, economic development and tourism participated in a discussion about PEI's place in the Atlantic Entrepreneurial Ecosystem at a presentation of the preliminary findings. Table cards about how mature firms can support start-ups were developed for the event.

Table 10 – Prince Edward Island (UPEI) Centrality (Ranked by Degree)

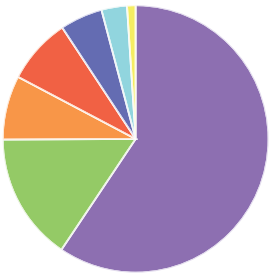
Id	Indegree	Outdegree	Degree	Weighted Indegree	Weighted Outdegree	Weighted Degree
Innovation PEI	21	0	21	148	0	148
resolveHR	0	18	18	0	82	82
New Career China Ltd.	0	14	14	0	86	86
Upstreet Craft Brewing	1	10	11	7	74	81
Formfree Branding Ltd.	0	11	11	0	61	61
UPEI	9	1	10	42	7	49
Stay Golden Apparel	0	10	10	0	61	61
Skills PEI	10	0	10	65	0	65
Airbly	0	10	10	0	54	54
Comfort Housekeeping Corporation	0	10	10	0	57	57
StartUp Zone	9	0	9	75	0	75
ACOA-APECA	9	0	9	49	0	49
Avonlea Cottages	0	9	9	0	41	41
National Research Council (NRC)	8	0	8	53	0	53
Greater Charlottetown Chamber of Commerce	4	4	8	24	19	43
COWS Inc.	0	8	8	0	58	58
Cradle Technology Design	0	7	7	0	37	37
Grant Thornton	7	0	7	48	0	48
The Catch Kitchen + Bar and Rise & Brine Pickle Co.	0	7	7	0	58	58
Sunshine Homes Network Inc.	0	7	7	0	43	43
CCG Learning and Coaching	1	6	7	7	34	41
King BBQ	0	7	7	0	43	43
Transportation Services Inc.	0	7	7	0	43	43
Shoplaw	0	6	6	0	30	30
PEI Connector	6	0	6	30	0	30

FIGURE 7 – PRINCE EDWARD ISLAND KNOWLEDGE-SEEKING ACTIONS (UPEI)

188 *nodes* **238** *edges*

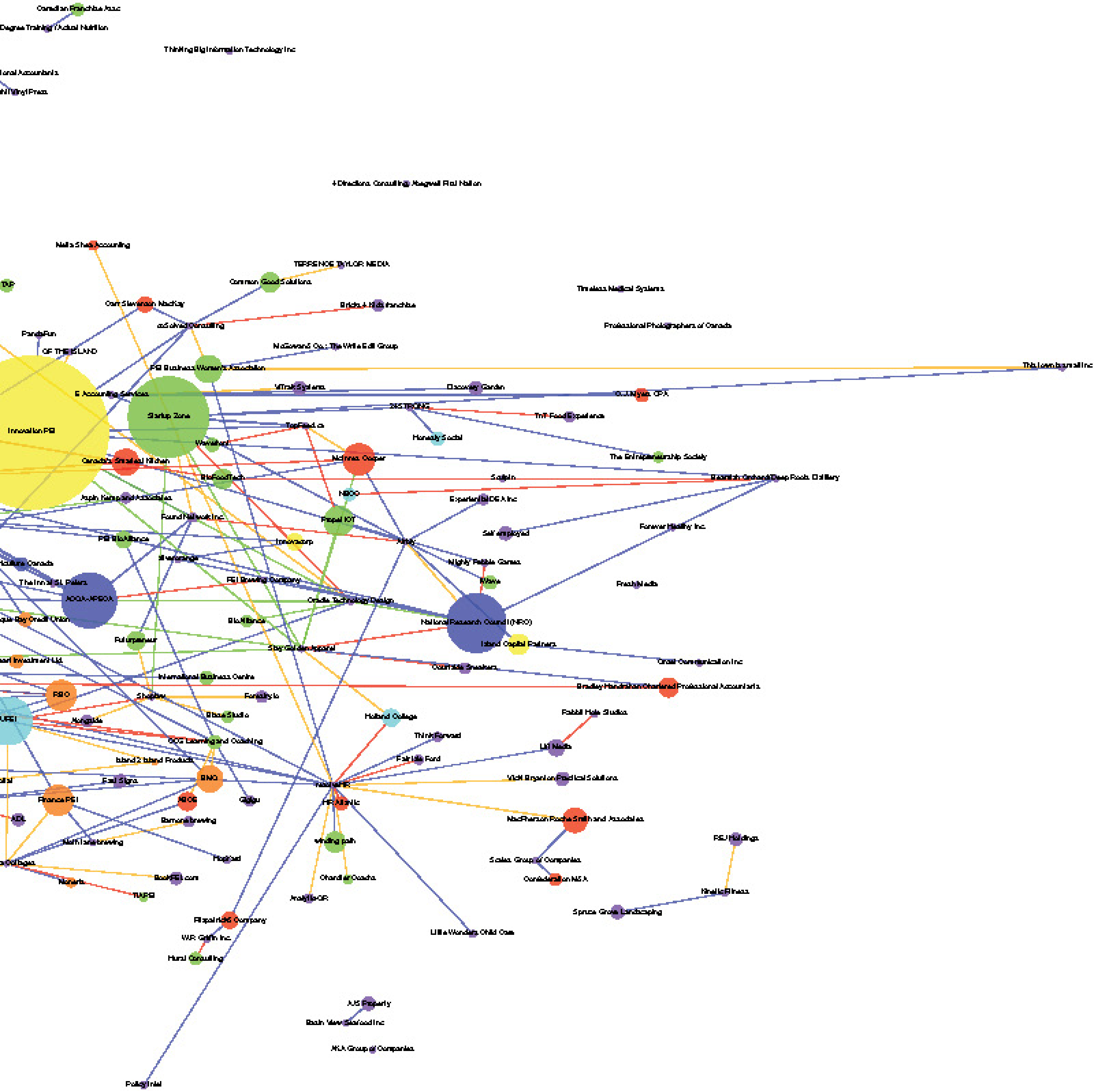
NODES

- Entrepreneurial Firm: 59%
- Support Organization: 16%
- Venture Capital/Angel Network: 2%
- Financial Institution: 8%
- University/College/Research: 2%
- Accounting/Law Firm: 9%
- Government Agency: 4%



EDGES

- Product/Service/Technical: 18%
- Business/Market/Financial: 60%
- Both: 16%
- Neither: 6%



Canadian Franchise Assoc
Thinking Big Information Technology Inc
TERRENCE TAYLOR MEDIA
Common Good Solutions
Timeless Medical Systems
Bricks 4 Kidz Franchise
Professional Photographers of Canada
OF THE ISLAND
PEI Business Women's Association
VitalTrak Systems
Discovery Garden
Startup Zone
Innovation PEI
Honestly Social
McInnes Cooper
The Entrepreneurship Society
Canada's Smartest Kitchen
BioFoodTech
Forever Healthy Inc.
Self employed
PEI BioAlliance
Innovacorp
Nimbly Pebble Games
FreshMedia
PEI Brewing Company
Oracle Technology Design
National Research Council (NRC)
Island Capital Partners
Futurpreneur
BioAlliance
International Business Centre
Holland College
Think Forward
Rabbit Hole Studios
MacPherson Roche Smith and Associates
Finance PEI
Winding path
Spruce Grove Landscaping
Kinetic Fitness
Little Wonders Child Care
Policy Intel
MA Group of Companies

NOVA SCOTIA

The data collection and project design by Saint Mary's University was led by Dr. Ellen Farrell of the Sobey School of Business. Nathan Dennison from NSBI was an instrumental associate in that process, as was the Province of Nova Scotia also played an instrumental role in the collection of this data. Dr. Farrell and Mr. Dennison led the project for the remainder of the Atlantic provinces and the various participating universities.

Nova Scotia's results identified 56 percent of the nodes as firms (a total of 427 firms). A later analysis indicated that a small number of them were mature firms. Support organizations were designated by 15 percent of the nodes. In Nova Scotia, the venture capital firms were represented by 11 percent of the nodes. This anomaly (from other provinces) was a result of the venture capital firms Innovacorp and Build Ventures responding to the survey in considerable detail. Many of the VCs talked to other VCs which caused the other VCs to be included in the data. Universities, research institutes and colleges were denoted by four percent of the nodes. The professional services accounted for six percent of the nodes and governments, five percent.

The 1472 searches for information were dominated by individuals executing knowledge search in the business/market/financial area in 79 percent of the cases (41% + 38% = 79%), and product/service/technical curiosity in 51 percent (13% + 38% = 51%) of the cases.

There is an obvious centrality in this chart. Yet three players, Innovacorp, Saint Mary's University and Build Ventures, are more peripheral in their centrality. Clearly large nodes with many solicitations for information (due to their size and the many edges emanating from them), these nodes are responding and reaching out to nodes outside of the central core.

As the project was unfolding, a conference was held at Saint Mary's University to highlight the impending work to be done. It was attended by 134 people from around the Atlantic region as well as Ontario. Largely focussed on policy-makers and their influencers, the day-and-a-half conference galvanized attention toward the work, the participants and its potential to better explore the emerging and successful Atlantic Entrepreneurial Ecosystem's potential findings.

Table 11 – Nova Scotia Centrality (SMU) (Ranked by Degree)

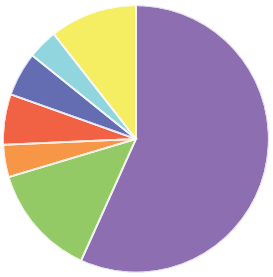
Id	Indegree	Outdegree	Degree	Weighted Indegree	Weighted Outdegree	Weighted Degree
Innovacorp	29	283	312	263	2536	2799
Build Ventures	17	178	195	161	954	1115
Saint Mary's University	21	73	94	225	313	538
NSBI	21	60	81	167	400	567
ACOA-APECA	33	31	64	286	209	495
Debenti	1	56	57	6	309	315
GrowthWorks Atlantic	11	35	46	94	276	370
Aramax IP Services	1	41	42	3	352	355
RBC	16	25	41	87	117	204
Enterprise Saint John	0	38	38	0	212	212
Craft Alliance Atlantic Association	1	35	36	7	216	223
Springboard Atlantic	11	22	33	66	129	195
Live Lenz	3	30	33	20	213	233
Knightsbridge Robertson Surrette	1	30	31	5	158	163
BioNova	2	27	29	21	167	188
CEED	8	21	29	57	138	195
NSCC	5	22	27	33	85	118
Cox & Palmer	15	9	24	120	56	176
IPECC	0	24	24	0	137	137
Ernst & Young	4	19	23	17	100	117
SimplyCast	3	20	23	19	73	92
Metro Green Dry Cleaners	1	22	23	4	142	146
Entrevestor	5	17	22	32	115	147
Scene Sharp technologies	1	21	22	5	132	137
McInnes Cooper	21	0	21	156	0	156

FIGURE 8 – NOVA SCOTIA KNOWLEDGE-SEEKING ACTIONS (SMU)

763 *nodes* **1472** *edges*

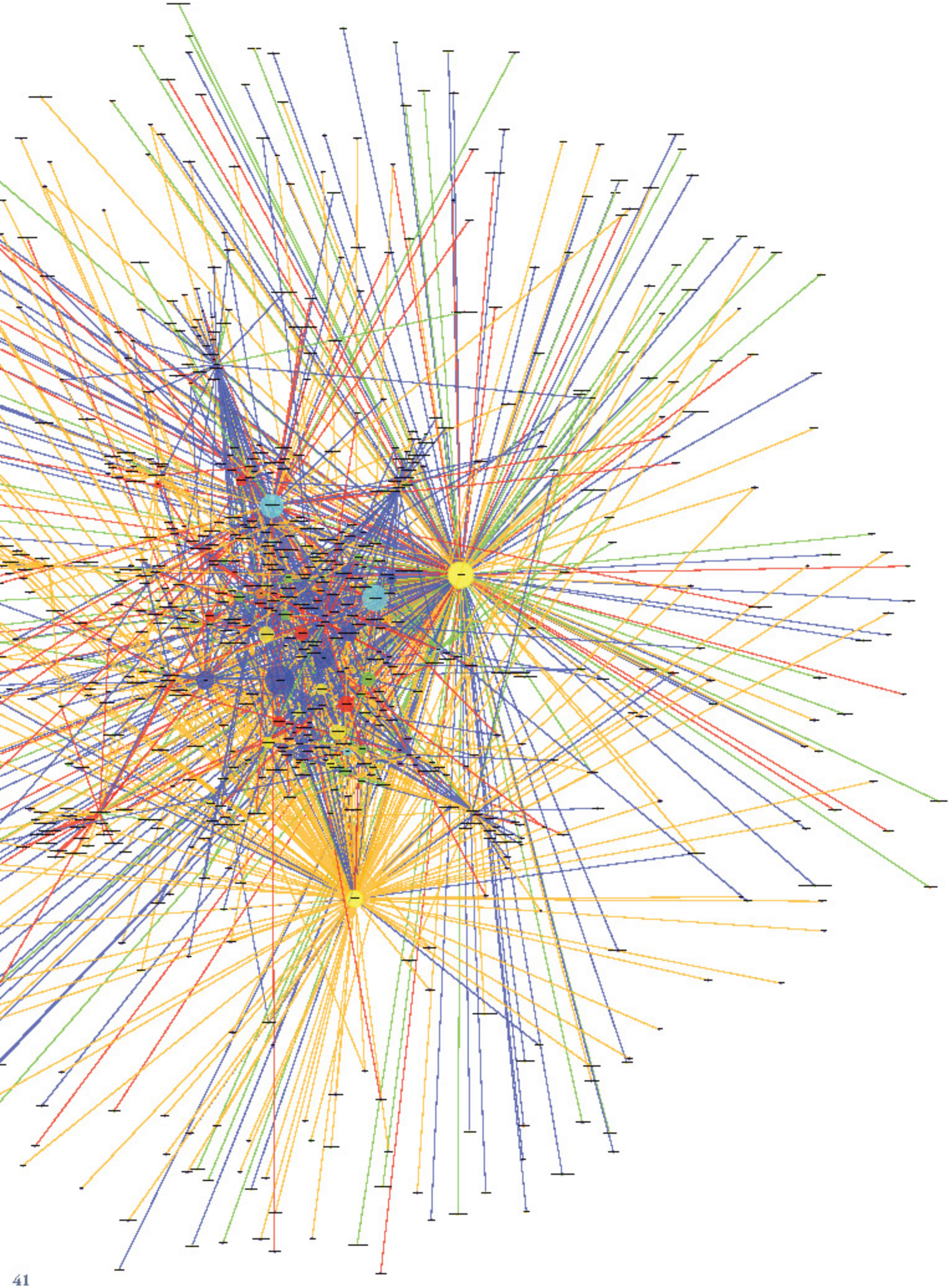
NODES

- Entrepreneurial Firm: 56%
- Support Organization: 15%
- Venture Capital/Angel Network: 11%
- Financial Institution: 3%
- University/College/Research: 4%
- Accounting/Law Firm: 6%
- Government Agency: 5%



EDGES

- Product/Service/Technical: 13%
- Business/Market/Financial: 41%
- Both: 38%
- Neither: 8%



CAPE BRETON ISLAND

The work in Cape Breton was conducted by Dr. Kevin McKague, Dr. Dannie Brown and Dr. Stephanie Gilbert at Cape Breton University. In a splendid show of enthusiasm, they worked with a number of local luminaries and agencies to hold an Entrepreneurship Blitz to promote the work and encourage participation by the local entrepreneurial ecosystem.

The respondents in Cape Breton highlighted 70 firms in their information-search activities (39% of 178 nodes). Thirty-one percent of the nodes were supportive organizations. A total of 5 percent of the nodes were embodied by venture capital and financial institution, and three percent of nodes denoted as universities/colleges/research institutes. Professional firms occupied 10 percent of the nodes as did government agencies.

The 263 searches for information were dominated by business/market/financial information (54% + 29% = 83%), and product/service/technical information searches comprised 43 percent of the search.

The lack of centrality in Figure 4 is refreshing. There is almost no congregation towards the centre, and even the larger nodes (large because they had many requests that were deemed very valuable those seeking the information) are on the periphery indicating these nodes are responding and reaching out to nodes outside of the central core.

Sixty-five (65) people participated in the features of the Cape Breton results of the Atlantic Entrepreneurial Ecosystem preliminary findings while attending the Community Innovation and Enterprise Conference held at the Shannon School of Business. People pored over copies of the charts, and handed them around, as a panel of six scholars addressed their observations.

Table 12 – Cape Breton Data (Ranked by Degree)

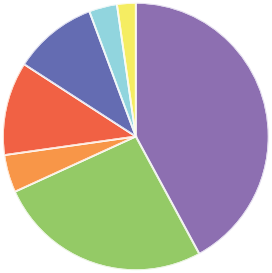
Id	Indegree	Outdegree	Degree	Weighted Indegree	Weighted Outdegree	Weighted Degree
Sandcastle Application Development	0	27	27	0	185	185
lokol.me	0	21	21	0	91	91
Cape Breton University	10	8	18	74	48	122
Island Folk Cider House	0	15	15	0	88	88
PizzaGo Ordering Systems	0	13	13	0	91	91
Docmaster	1	12	13	5	70	75
Marcato Digital Solutions	5	7	12	27	47	74
ACOA-APECA	11	0	11	77	0	77
Pan Cape Breton Food Hub Co-op	3	7	10	20	58	78
Big Spruce Brewing	0	10	10	0	66	66
CBDC	10	0	10	61	0	61
Baddeck Market	4	6	10	25	25	50
Scotia Software	0	9	9	0	83	83
902 Advertising Group Ltd.	0	9	9	0	74	74
Albert Bridge Alpacas	0	9	9	0	72	72
TALO Cafebar	0	9	9	0	51	51
Inglis Print and Promo	0	9	9	0	83	83
National Research Council (NRC)	8	0	8	51	0	51
Innovacorp	8	0	8	62	0	62
Collegio Technologies	0	7	7	0	25	25
Localmotive Farm	0	7	7	0	50	50
First Impressions Medical Aesthetics & Rejuvenation Clinic	0	7	7	0	53	53
Escape Outdoors	0	7	7	0	39	39
Venture Solutions	3	3	6	29	18	47
Grant Thornton	6	0	6	37	0	37

FIGURE 6 – CAPE BRETON KNOWLEDGE-SEEKING ACTIVITIES (CBU)

178 *nodes* **263** *edges*

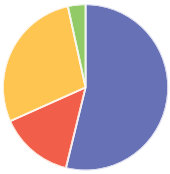
NODES

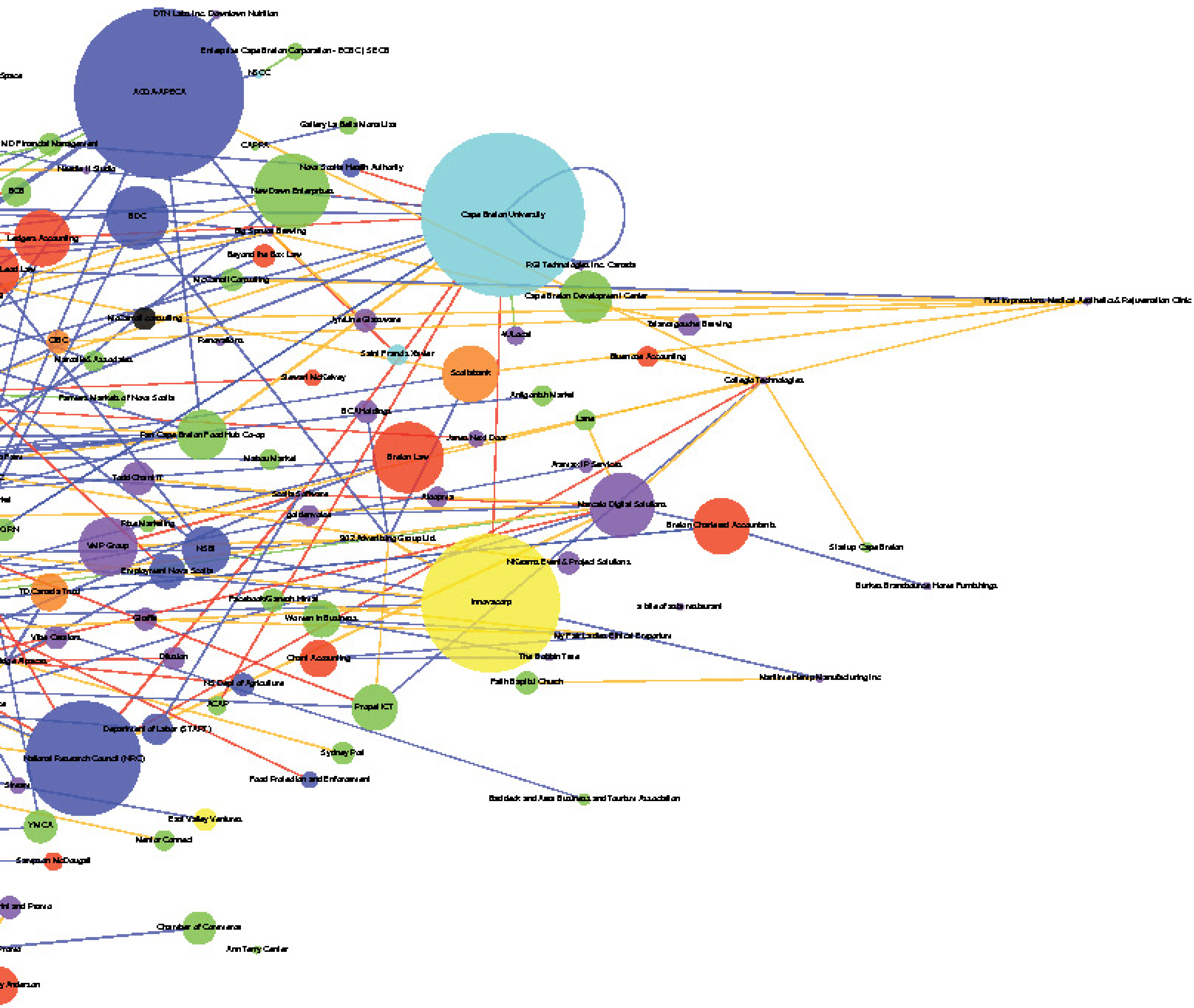
- Entrepreneurial Firm: 39%
- Support Organization: 31%
- Venture Capital/Angel Network: 2%
- Financial Institution: 3%
- University/College/Research: 3%
- Accounting/Law Firm: 10%
- Government Agency: 10%



EDGES

- Product/Service/Technical: 14%
- Business/Market/Financial: 54%
- Both: 29%
- Neither: 3%




DTN Labs Inc. Downtown Nutrition
Enterprise Cape Breton Corporation - ECBC | SECB
NSCC
ACOA/APECA
Gallery La Bella Mona Lisa
CAPRA
ND Financial Management
Nova Scotia Health Authority
New Dawn Enterprises
CBB
BDC
Cape Breton University
Ledgers Accounting
Big Spruce Brewing
Beyond the Box Law
McConnell Consulting
FXG Technologies Inc. Canada
Cape Breton Development Center
First Impressions Medical Aesthetics & Rejuvenation Clinic
Saint Francis Xavier
Scotiabank
Burnside Accounting
Collagio Technologies
Stewart McKelvey
Antigonish Market
BCA Holdings
Farmers Markets of Nova Scotia
Fort Cape Breton Food Hub Co-op
Breton Law
Nabou Market
Scotia Software
Nomadic Digital Solutions
Breton Chartered Accountants
VAP Group
NSBI
Employment Nova Scotia
Startup Cape Breton
TD Canada Trust
Innovacorp
Women in Business
Chant Accounting
The Bobbin Tree
Faith Baptist Church
NS Dept of Agriculture
Propel ICT
Department of Labor (START)
National Research Council (NRC)
Sydney Post
Food Protection and Enforcement
Baddeck and Area Business and Tourism Association
YMCA
Mentor Connect
Chamber of Commerce
Ann Terry Center

Findings & *Results*

To study the context of entrepreneurial ecosystems entails numerous variables associated with cultivating regional advantage: a combination of community, success, concentrations of university talent, growing pools of venture capital funding, and adept abilities to adopt new paradigms [6]. Some works have highlighted the groups of constituents contributing to the ecosystem and have built models illustrating the flow of activities amongst the groups [i.e. 7, 8]. Some other works have constructed economic models using expenditure and investment data related to the ecosystem, for example [9]. Autio, Kenney et al. [1] have built a framework for investigating entrepreneurial ecosystems within the context of the industry, technology, social policy and organizational context, and related policy concerns, but also temporal and global, national and regional innovation systems. Some ecosystem research is based on survey data of measurements such as location decisions [10], and interpretive analysis resulting in theoretically constructed propositions [11]. A longitudinal analysis of the inventor networks highlighted the emergence of clusters and networks in specific industrial classifications [12].

Knowledge-seeking by an ecosystem's constituents opens founders to complementary competencies and resources to gain access to new ideas and people. The formal deliberate personal approaches measured here are active methods of engagement; participants had to engage in phone calls, emails or personal meetings for data points to be acknowledged. High-tech innovators and founders exploit existing opportunities and deploy their networks to form new contacts and relationships that help initiate new opportunities [13]. Moreover, technology entrepreneurs (like many in this university-rich region) prefer dense and strong networks that facilitate the transfer of tacit and fine-grained technical knowledge [14].

The purpose of this major work is to investigate the curiosity of the participants in an entrepreneurial ecosystem, the extent to which ventures search for information to advance their ventures, and to assess the relationships amongst the various groups of actors in a more structured manner. This was done by surveying knowledge-seeking behavior and using network theory to illustrate the distribution of information-seeking activities, and to develop and quantify metrics amongst and between various constituents. This introduces context by avoiding focusing on the firm or the entrepreneur, but rather looks at the relationships amongst the participants in the ecosystem.

It is important to remember that this is not a study of `who knows who. It is not a study of social networks, nor LinkedIn accounts, nor Twitter, nor Facebook, nor Instagram. It is not a study fashioned from pre-existing big data. It is carefully constructed investigation using survey data of who comprises Atlantic Canada`s entrepreneurial ecosystem by looking at who reached out to who. Most of our ecosystem participants you will readily recognize. Other members of our ecosystem, you will never have heard of before.

1. COMPLEX KNOWLEDGE-SEEKING ACTIVITIES

The knowledge-seeking activities of the AEE are very complex. There are 1666 different organizations represented in the reported AEE (the nodes coloured to show their constituent group) and 3397 separate knowledge-seeking activities defined (the directional lines between nodes).

Table 13 - Atlantic Entrepreneurial Ecosystem Network Statistics by Collection Point

	Comp.	MUN	UNB	UdeM	UPEI	SMU	CBU
Nodes	1666	330	250	151	188	763	178
Edges	3397	789	250	250	238	1472	263
Average Degree	2.039	2.391	1	1.656	1.266	1.929	1.478
Avg. Weighted Degree	10.951	13.194	6.572	9.265	7.548	12.595	9.758

Fifty-seven percent (57%) of all of the nodes in the AEE represent firms, both entrepreneurial and a few mature firms. The next largest group of constituent organizations noted by respondents are support-type organizations at 17 percent. Seventeen percent embodies 283 supportive-type organizations spontaneously noted by venture founders and includes pitch groups, competitions, incubators, accelerators, entrepreneurship centres, mentoring assistance and various other programs.

Together, venture capital and business angels (7%) and financial organizations (4%) represent 11 percent of the ecosystems' constituents identified by respondents.

Professional firms were noted in eight percent (8%) of the nodes, and governments and their agencies are seven percent (7%) of the nodes Universities comprise three percent (3%) of the nodes indicating a total of 49 universities, colleges and technical universities noted in the ecosystem. The University of Ethiopia is one of them. This is not an error, this means that a survey respondent reached out to the University of Ethiopia to find the answer to a question that impacted their business interests Various types of Federal and Provincial governments, and professional firms represent the bulk of the remaining named organizations that were named in the AEE.

The tables in each of the data collection locales should not be interpreted too literally. There were two data collection points for each university except for UPEI. Moreover, the results are to capture a look at the Atlantic Entrepreneurial Ecosystem. It is heartening to see that the provinces are talking to one another and entrepreneurs and support organizations and governments and VCs are reaching out beyond their immediate and extended borders. First Angel Network is in the Moncton data, the Centre for Women in Business is in the UNB data. NBIF and East Valley Ventures is in the SMU data. This is what an effective ecosystem wants to do, first dispel the provincial boundaries, and then reach out beyond Atlantic Canada.

The one group of participants that emerged unexpectedly in the constructivist approach adopted here were professional advisors. When asked to generate their own list of knowledge-search activities, respondents consistently noted the professionals and particularly legal firms. This group is not mentioned in a prominent way in any of the entrepreneurial ecosystem research to date. Those drawing entrepreneurial ecosystems, or prescribing the organizations that were dominant and central, did not mention lawyers and the professional firms at the centre.

Apparently, the search for professional knowledge is acute. The legal community has responded to this with a keen interest in cultivating enterprising clients: the law firms are present in incubators and accelerators; they overtly advertise and promote to start-ups; they hold free clinics in locations where start-ups are common; they are happy to entertain university speaking engagements; and they are sponsors at entrepreneurship pitches and events. The rush to incorporation by co-founders is an outcome of their considerable promotional efforts, and the search for funding. The drive for formal funding necessitates legal services related to the interpretation of term sheets, development of capital tables, adhering to closing dates, and general contractual oversight.

2. MANY MAKE THE WHOLE

The ecosystem as defined by entrepreneurs includes a range of types of constituents. Those that emerged were similar to those represented in other more high-level observational analyses of entrepreneurial ecosystems. The more quantitative, and detailed analysis here provides a new level of depth. In Table 15 - Performance of Ecosystem by Eliminating Constituent Groups, the performance of the whole AEE was calculated. To compare the relative importance of the various constituent groups, major groups were removed from the ecosystem and the statistics re-calculated. The AEE knowledge-seeking options are optimized when all the major constituent groups are in place. Removing any one of the constituent groups (except the entrepreneurs of course) causes the Average Degree statistic of knowledge-seeking behaviours to decline.

Table 15 - Performance of Ecosystem by Eliminating Constituent Groups

	AEE	AEE Minus Government	AEE Minus Support Organizations	AEE Minus University, College, Research	AEE Minus Venture Capital, Angel Network
Nodes	1666	1550	1397	1614	1567
Edges	3397	2378	2335	2906	2861
Average Degree	2.039	1.534	1.671	1.800	1.826
Avg. Weighted Degree	10.951	7.56	9.22	9.63	9.69

This interconnectedness of the constituent groups is amply highlighted in the charts shown earlier, however, the metrics associated with the analyses specifically demonstrate the dwindling effectiveness of the ecosystems knowledge-seeking behaviours when one of the other major non-entrepreneurial constituents is withdrawn. The incremental value that each group of actors contributes to the ecosystem signifies the synergy present in the combined group of entrepreneurs, governments, support groups, professionals and venture capitalists. Removing any one of the various groups of actors causes the average degree of knowledge-seeking behaviours to decline. The AEE is more knowledge-seeking -- more seeking of innovation and entrepreneurship -- when all the major groups of constituents are in place.

Numerous works recognize the importance of policy makers, universities, mature firms, and investors [see 15]. However, most of these works are not quantitative, nor survey-based, nor based on knowledge-search. This work demonstrates the amount of knowledge-search that exits in a functioning ecosystem where ventures are reaching out for venture assistance.

What is not shown, however, is the outreach of the governments, university agencies, law firms, and the remaining venture capital firms (except a few notable exceptions like Build Ventures and Innovacorp that responded in detail to the survey). They are clearly responding to the requests made by entrepreneurs, but are the governments, universities, law firms, and investors making contacts with one another? Are they making contacts with entrepreneurs? Are they making contact with organizations outside of the country and the continent? Are these constituent groups attempting to reinforce the local ecosystem with information from other ecosystems around the world? Are the constituent groups' members bringing innovative information to the local table by talking to and learning from individuals in other ecosystems? The nature of the survey questions discourage some agencies from responding to surveys.

This is corroborated by extant research. Governments alone cannot establish, or mandate, or make an entrepreneurial ecosystem [16]. It is the value creation contributions of many actors working in concert through their interconnectedness [17] that results in a functioning ecosystem. However, governments have been very influential in many of the world great ecosystems. Israel's success, for example, is attributed to significant government program support development over-laid onto an entrepreneurial culture. The small isolated country has a small domestic economy relative to other entrepreneurial powerhouses in the world, yet has built and maintained important international ties [18]. In Munich, cooperation amongst normally competing universities is accomplished with private funding. The efforts are aimed at various programs and levels of universities (research, curricula, mentorship, incubators, etc.) [19].

Belgium's efforts are similar to the Atlantic region's situation. Belgium's example is that of a government attempting to amplify the opportunities of a regional economy that has lost its manufacturing base. Belgium's method to deal with their small domestic market is to focus on IT and born global companies. This is facilitated by an independent government body created for the purpose [20].

Taiwan, created a technology economy partially by drawing on the emigres that went to Silicon Valley. This initiative was direct government interventions. Decades later, their technology supercluster is challenged as the manufacturing moves to lower costs locations divesting Taiwan of domestic economic advantages [21]. Four years ago, at an event in Silicon Valley with the C100 group pointed out that there are 300,000 Canadians working in San Francisco. Three hundred thousand! What kind of uptick could the Atlantic region see if even a fraction of the Canadians (Atlantic) working in Silicon Valley, or Seattle, came home bringing with them their ultra-honed understanding of problem identification and precision execution.

The one group whose role *it is not* when creating a vibrant entrepreneurial ecosystem, is the entrepreneurs. The entrepreneurs' responsibilities are to identify significant problems, find ways to solve them, raise funding to do so, and execute in a manner that brings the solution to life, find willing customers, and create product-market fit. The rest of the ecosystem are figuratively the support staff. The entrepreneurial culture and underpinnings are the foundation on which the other constituents build their programs, products, services, and support – and an ecosystem emerges. Failures in this regard are a result of important ecosystem participants acting without engaging with the entrepreneurial community.

3. BUSINESS/MARKET/FINANCIAL INFORMATION DOMINATES KNOWLEDGE-SEARCH

The knowledge-search activities of the entrepreneurs in the ecosystem is dominated by business/market/financial information. There is, of course, a preponderance of business/market/financial information available to be taken advantage of. The overwhelming search for business-type information rather than scientific/product or technical knowledge-search is maybe not surprising, but it is somewhat concerning. The search for finance is the single largest hurdle for all founders so almost every venture team will be focused on the business side. On the other hand, outreach designed to spur innovation will need curiosity aimed at the more technical/product/design investigations to create new technologies and product solutions.

When entrepreneurs are competent in the innovation, design, science and production of their products, their information needs gravitate to the development of markets, delivery, finances of product, sales techniques and methods of building a firm. This explanation would be reassuring and expected by technical entrepreneurs challenged by business and financial resources and capabilities.

Alternatively, this outcome is troublesome if entrepreneurs' products lack the technical, design, innovation resources necessary to make competitive businesses, while founders are spending their time seeking business and financial advice. If venture teams focus their knowledge-search on business-building activities with little or no product innovations or design improvements, difficulties related to immature innovations may prevent sustainable business models.

4. TOO ATLANTIC CENTRIC

The interconnectedness of the constituents in the AEE is amply highlighted in the charts in the Analysis Section. In two sub-sets of the data, an analysis of the location of the respondents and their alters was conducted. The geographic assessment showed a preponderance of nodes within Atlantic Canada and North America was somewhat disquieting. In Figure 9 - Node Geographic Locations (Individual) Data Subset, approximately 75 percent of the nodes were situated in the Atlantic region. Encouragingly, 15 percent of the nodes were from the rest of Canada, nine percent were from the U.S. Only one percent were globally based beyond the North American continent which represents 30 knowledge-search actions.

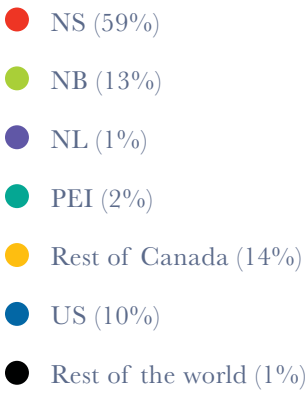
In the other sub-set of data, looking at organizations reach geographically, the proportions were different, but similar. Atlantic Canada was the source of 25.9 percent of the knowledge-search actions, and 4.1 percent of them (40 of the 984 knowledge-search actions in the sample) were classified as Rest-of-the-World meaning beyond North America.

Loosely speaking, 25 percent of knowledge-seeking behaviours by individuals and organizations of the AEE are not proximal to Atlantic Canada's geographic location; they are outward-facing. Their orientation faces either the rest of Canada, or the US, or elsewhere.

These seem like reasonable numbers, but there is little with which to compare them. Given that it is virtually costless to communicate with someone half-way around the world, could there not be more outward-facing knowledge-search actions? The innovation advances that come with information sought outside of one's normal sphere of influence is boundary-spanning novel information more prone to bringing substantial innovations with it.

FIGURE 9 – NODE GEOGRAPHIC LOCATIONS (INDIVIDUAL) DATA SUB-SET

1,268 *nodes* **1,871** *edges (arcs)*



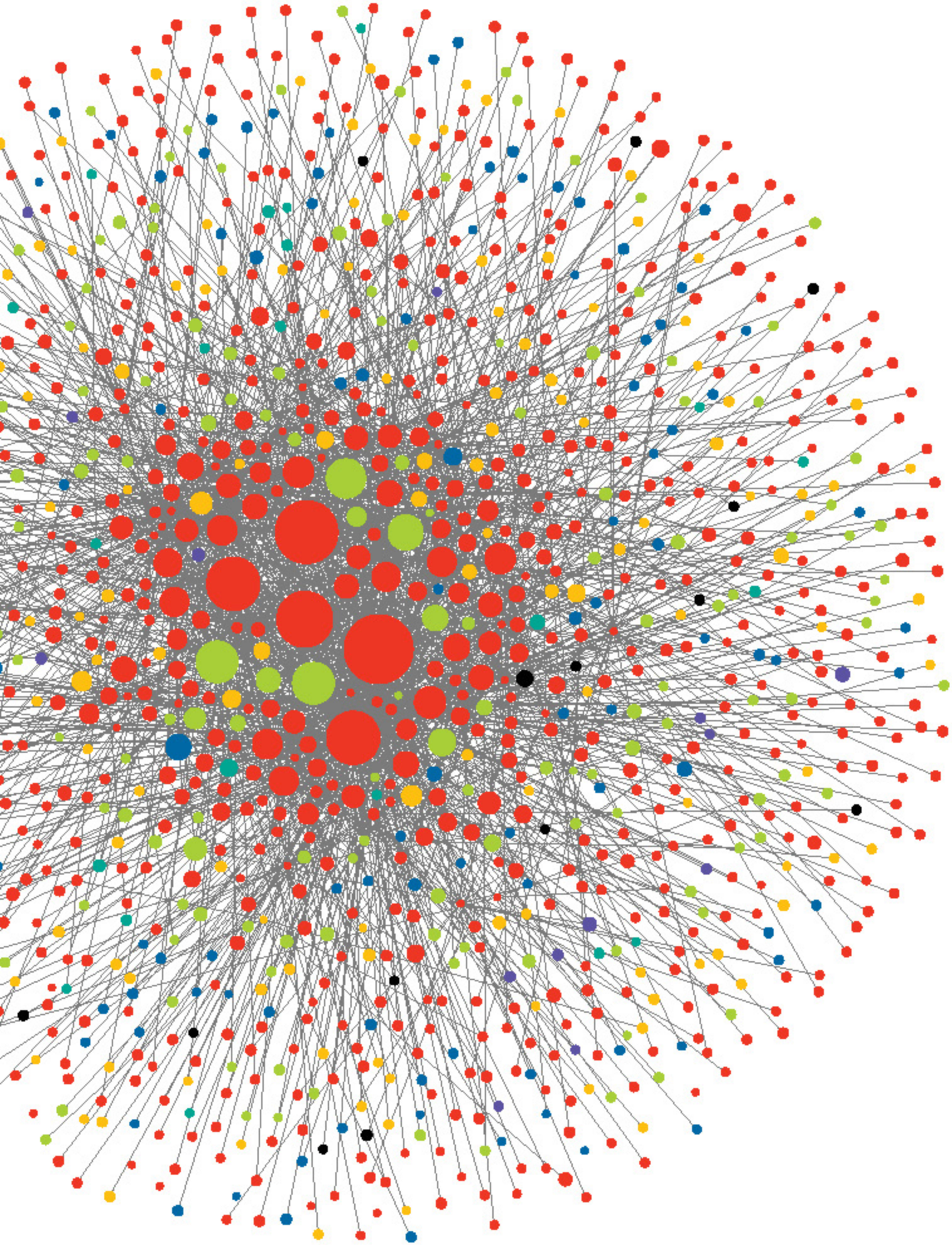
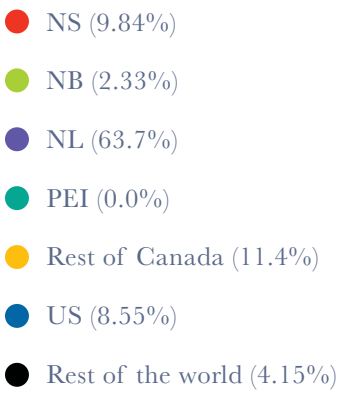
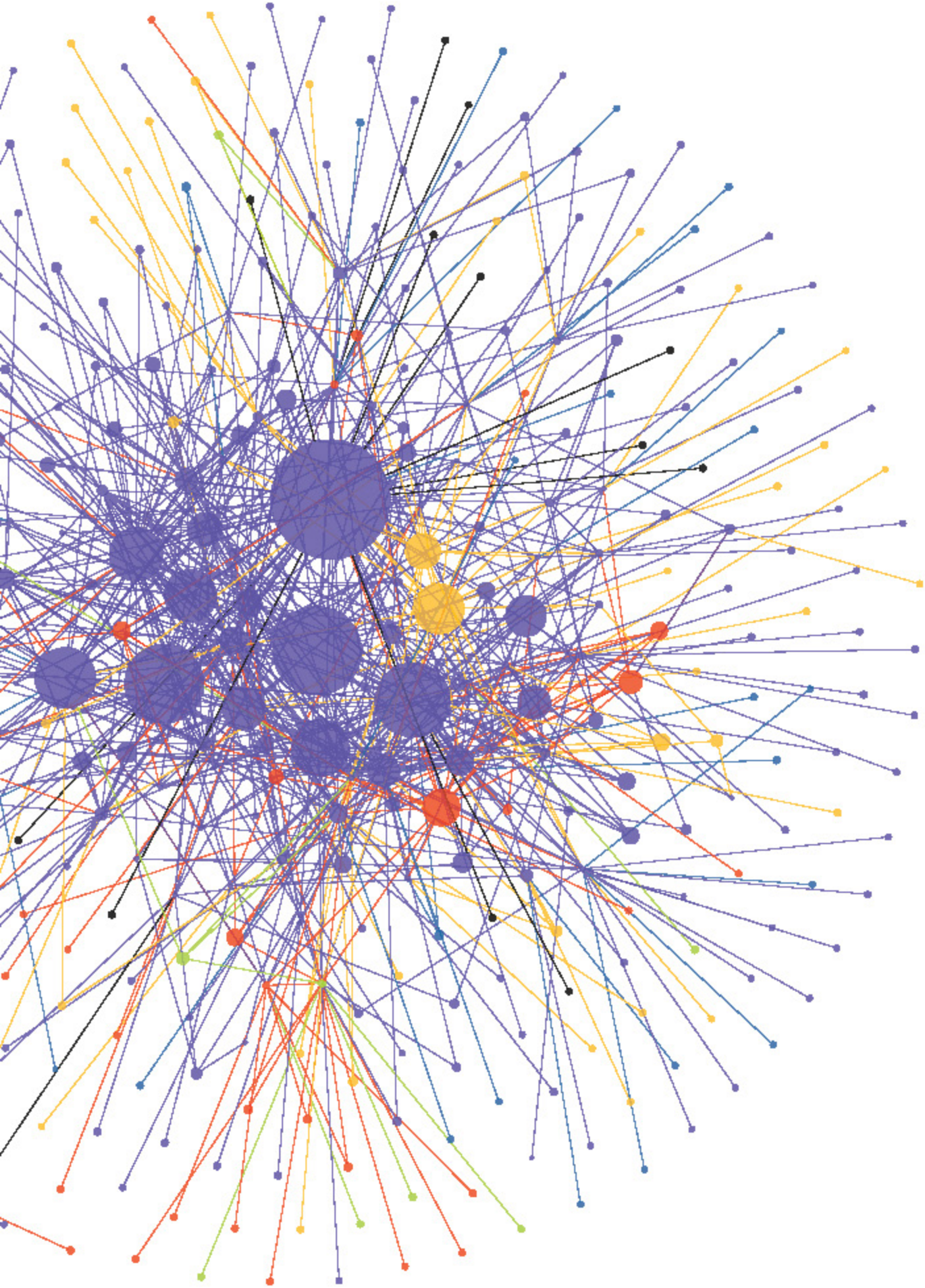


FIGURE 10 – NODE GEOGRAPHIC LOCATIONS (ORGANIZATION) DATA SUB-SET

386 *nodes* **984** *edges (arcs)*





5. ASPIRE TO GLOBAL RECOGNITION – BE MORE DIGITALLY DISTANT

Reaching out around the world is important for ecosystem success. The successful ecosystems and clusters of the world are global in their geographic reach. Whatever their origins, they end up greatly networked and they do not operate as isolated locales. Atlantic Canada should "resist the isolationist inclination to engage in most of our information search in our own geographic locale" [22]. If all ecosystem actors expand extra-local knowledge-seeking, new international linkages could be shared; forge new relationships; combine resources for the ecosystem to be represented on trade missions to other ecosystems; invite other ecosystems to come here.

We have much to talk about. If the most successful ecosystems and clusters of innovation are distinctive in that their geographic reach is global, and we know about them, do they know about us? Atlantic Canada has: an active and motivated ecosystem; smart talented entrepreneurs and founders; a host of universities, science and business-based knowledge; and young and international workforce.

Let us not forget the abundance of entrepreneurs who have had successful exits. The world is beating a path to our door to purchase Atlantic Canadian equity. An incomplete list of the firms which have purchased Atlantic Canadian founders and investors'include: Lynda.com (Compiler), SalesForce.com (Radian 6 and Go Instant), IBM (Q1 Labs), Verisk Analytics (Analyze Re), Samsung (New Pace Technologies), Venor (Equals6), AOL (Info Interactive), Patron Technology (Marcato Digital Solutions), American Forest Foundation (Woodscamp), Croda International, UK (Nautilus Biosciences Canada), Towers Warson (Brovada), AOL (InfoInteractive), Foto Search (CanStockPhoto), Royal DSM (Ocean Nutrition), Legado Capital (Kivuto), Allied Universal (Source Security and Investigations), Vinci Energies of France (ADM Systems Engineering), Quintiles IMS (STI Technologies) just to name a few.

Ecosystem actors can expand extra-local ecosystem connection and promotion:

- Develop new international linkages with other ecosystems,
- Create regular coordination of information sharing with other ecosystems to forge new regional links;
- Design and coordinate "campaigns" to create an awareness of the Atlantic ecosystem and its growing list of successful founders and investors;
- Sustain the activity to encourage an increased and growing awareness of Atlantic Canada;
- Combine resources to attend trade missions and trade shows with specific mandates to cultivate promotion of the Atlantic Entrepreneurial Ecosystem;
- Find professional "equivalents" in other jurisdictions to reach out to, and stay in touch;
- Recruit and disseminate information to a specific ecosystem such as North Carolina/Boston/London/Chicago/Israel/Belgium.

The most successful clusters of innovation are highly connected on a global level and they utilize their durable bond relationships with other clusters to enhance their resources, leverage information, access markets and accelerate innovation. Even the most famous Silicon Valley was described as having run out of room geographically, by being situated in a valley enclosed on both sides, eventually turned to other regions of the world to expand their network [23]. "These linkages, and the networks they construct, allow participants to reap benefits beyond those derived from proximity groupings and achieve efficiencies and innovation on a global scale" [24, p 27].

Global connections serve to span boundaries, bridge structural holes, and connect networks. Global connections encourage the mobility of people in and out of businesses and regions, promote the transfer of high technology know-how, encourage the development of born-global firms, increase the participation of specialized support groups to cross pollinate activities and resources, stimulate the movement of people between industry and academia, and foster deep expertise for specific support mechanisms.

During a presentation to an international audience about weak ties and global reach, contact was made with Dr. Christopher Longhi at the large park at Sophia Antipolis in France. Having studied the now 35,000-person park using network theory, Dr. Longhi said it was little more than a couple of mature firm research centres three decades ago. In an effort at outreach, I have encouraged Dr. Longhi to visit Atlantic Canada – that there would be a large group of community and policy leaders who would be interested to meet him. I contact him occasionally to ensure he remembers North America's closest entrepreneurial ecosystem.

In much social network analysis the most important nodes are denoted by centrality. That these nodes are connected to many other nodes is seen as the epitome of popularity or prestige. Those nearest the centre, and with the largest centrality scores are the most important nodes. Centrality is the concept which answers the question Who are the most important nodes in the network.

In entrepreneurial ecosystem research such as this, investigating knowledge-search activities, it is not clear that the typical types of centrality described above make a node the most important. The goal is that those of us who are geographically proximal need to act digitally distant. We are here, but we need to reach out to there. As described in the paper about strong and weak ties [25], weak ties that span structural boundaries (people reaching out for information from others whom they only know peripherally, or met at a conference, or read about in an article or scientific journal, are more likely to gather innovation-rich information. These people bridge collections of networks allowing information to cross from one group to another group via an individual. This would not necessarily include the node that is the most sought-after node in the ecosystem.

In the context of an ecosystem aspiring to be more outward-facing, it is not those nodes who are talking locally to one another who are the most important. They are popular for sure. If the goal is to reach out to a global audience, beyond our borders and even our continent, those nodes which are large but which exist on the periphery of the charts take on more significance. They are the nodes that have many connections (which makes them large in the charts), but they are not focused on the largely-domestic connections in the centre; they have many connections to nodes that have other connections.

Greg Curwin at TruLeaf, for example, brought vertical farming from Japan to the Nova Scotia, New Brunswick and Ontario contexts. While it took a number of years for Greg to convince others, several rounds of finance later TruLeaf is now estimated to be closing in on a 9-figure valuation. Greg did not spend all of this knowledge search in the local ecosystem.

An effective geographically centralized ecosystem wants to be digitally distant when investigating a knowledge-search perspective because that is the source of new innovation into a region. A digitally distant ecosystem is characterized ecosystem agents that scour the world for answers to problems they want to solve locally.

6. ADOPT KNOWLEDGE-SEEKING THAT INCORPORATES WEAK TIES

In entrepreneurial ecosystems or clusters of innovation, networks of actors acting in their roles encourage entrepreneurial activity in a region. Ecosystem participants gather information to enhance the mobility of people, talent, know-how, capital and other tangible and intangible assets. Deliberately reaching out for information, called knowledge-seeking here, opens founders to complementary competencies and resources accessed via new knowledge and people.

Even more vital to innovation is the search for information from persons who are only casually known. Persons who provide information, but are only know casually, are known as weak ties. Weak ties are important because new information from casual contacts and relationships is more likely to be novel and unique than the information derived from close friends and family [26]. The individuals studied here, who reach out beyond the region's normal sphere of influence, could be boundary-spanning individuals bringing diverse domains together and reaping disproportionate economic rents [27]. Advanced strides in innovation occur when founders marry information that crosses boundaries of knowledge, referred to as structural holes [27].

Individuals seeking information from weak ties parse information from diverse subjects and bring significant dissenting and discriminating insights to their ventures. Networking is a type of weak tie development, especially for high-tech innovators [13]. Weak ties also arise from: person-to-person networking, personal inquiries, casual acquaintances, open innovation requests, conferences, attending industry trade shows, and other person-to-person interactions. Weak ties are an essential element in the clusters of innovation framework and the subsequent acceleration of entrepreneurship as ecosystem participants seek information from specialized support groups, trade fairs, conventions, professional gatherings, universities, governments, and industrial collaborations.

This finding prompted Dr. Farrell to author the research paper "Weak Ties and Global Reach: Network Theory and the Atlantic Entrepreneurial Ecosystem presented to the 7th International Research Meeting in Business and Management sponsored by the Telfer School of Management (UOttawa), Groupe ESC Troyes en Champagner, IPAG Business School and the University of Nice Sophia Antipolis. This paper is included in the section titled RESEARCH PAPERS & REPORTS. The work by Granovetter and Burt and Engels was instrumental in knitting together the findings above.

An example of this is a firm amongst the data called Rheingold Exploration started by Paul Pedersen. Paul is connected to the ecosystem only by NS Labour and Advanced Education (SMU data collection site) while living and working from British Columbia. After graduating, Paul created four publicly traded firms which were each sold in reverse take-overs making all his investors very happy. Happy investors generally makes it easier to raise funds in successive ventures. Paul transported his knowledge of extraction processes for small producers in the mining industry into the cannabis industry. He is now the sole patent holder for extraction in the cannabis industry in the United States. Paul recently purchased a moth-balled pharmaceutical manufacturing plant in Cape Breton which will be reconfigured to extract oil from low-grade cannabis. This is an amazing example of spanning knowledge boundaries: from mining to cannabis, from British Columbia to Nova Scotia, from low quality ore to low quality cannabis.

Multiple and/or increasingly frequent connections made between actors over a duration of time stimulates durable bonds [28]. The increasing reliance on sources of information that were once weak ties ultimately build durable bonds as ecosystem participants foster more reliance upon one another.

7. PARTICIPATION OF MATURE FIRMS: COSTLESS TO MATURE FIRMS / PRICELESS TO ENTREPRENEURS

An examination of a sub-set of entrepreneurial firms shows that there is little interaction between entrepreneurial and mature firms in the ecosystem. The ecosystem needs leadership to encourage more mature firm participation. A first inclination regarding the role of mature firms in an entrepreneurial ecosystem or a cluster of innovation is that the mature firm purchases products from the ventures, or becomes a supplier to them. This is rarely the case as young firms struggle to achieve the level of commercialization necessary for start-ups to rise to the scale of production, and standards of purchasing and selling processes required by mature firms.

Large or mature firms have played a significant role in other successful ecosystems particularly Israel, Silicon Valley, Sophia Antipolis. Mature firms are defined as established and secure, though not necessarily large, companies engaging in trade in the ecosystem's geographic proximity. Knowingly, or unknowingly, mature firms contribute to entrepreneurial networks because they: catalyze the mobility of resources; create their own spin-offs; hasten testing and the development of commercializing processes; and cultivate start-up know-how and business practices in pre-founders (their employees); and offer support by way of capital.

Mature firms catalyze the mobility of resources – particularly human resources. Mature firms promote the frequent flow of people around and throughout the ecosystem, thereby enriching collaboration. The mixing and recycling of talent amongst mature or enterprise and venture firms produces knowledge spinoffs that benefit both parties.

Abundant skills diffused throughout an ecosystem are enhanced by the presence of mature firms. Mature firms develop skills in their current employees that encourage them to become pre-founders. Mature firms cultivate deep knowledge in specific areas that pre-founders acquire during their careers as employees. Successful ecosystems tolerate -- indeed encourage -- the rapid recycling of talent, and the movement of people between and amongst firms, large and small. This mobility of human capital facilitates the transfer of tacit knowledge, intellectual collaboration and rapid validation and success, or equally as important, rapid failure.

To support this finding, take-away table cards were developed for the Atlantic Summit of the National Angel Capital Organization in June 2018; the SMU President's speech to the Halifax Chamber of Commerce (on entrepreneurship); and UPEI's Charlottetown Community Engagement in June 2018 . The take-away table cards identified specific methods that mature firms could employ to assist entrepreneurial firms.

Mature firms help start-ups adapt business models, test technology, and develop or improve management practices. Modest encouragement by mature companies can provide exceptional opportunities developing founders, and very early-stage ventures benefit from close proximity to, and mentorship by, successful mature firms. During early-stages entrepreneurial development, many new venture teams focus on the product instead of the business and the business model. Rapid testing and validation foster the develop-pivot-redevelop learning process [29] that accelerates entrepreneurs' understanding of success or failure with respect to the business model, and thus movement towards commercialization. Established mature firms can accelerate start-ups validation processes by testing prototypes, providing access to resources, hiring (or firing) talent, prescribing the necessary logistics of selling into specific markets, cultivating the development of document control procedures in larger firms, evaluation and insights.

Some mature firms may be able to emulate customers for the region's start-ups, thus helping speed time-to-product-market-fit. Product-market fit is the most important hurdle to overcome as young technologies struggle to match the needs of the customers with the features of the product. The product cannot simply work, it must meet the needs of the market, the customers. This is often the fatal flaw for otherwise promising founders. Even when the region's mature firms are not viable customers, their support can mimic the needs of enterprise helping speed small firms along.

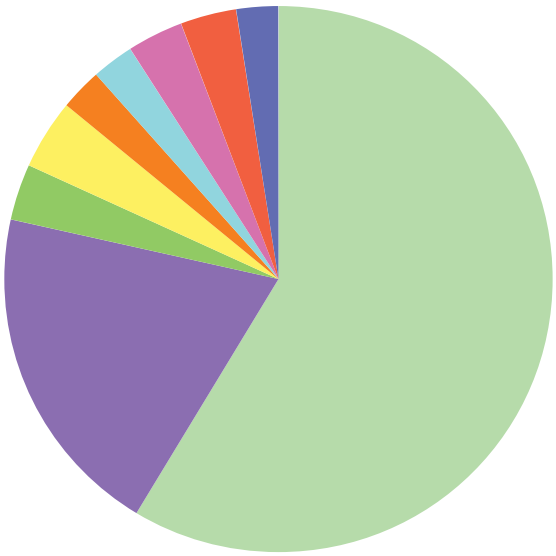
FIGURE 11 – MATURE FIRMS PARTICIPATION IN THE ENTREPRENEURIAL ECOSYSTEM

A sub-set of nodes were re-interviewed to identify their status as a mature firm. Nodes not connecting with mature firms were omitted from this chart.

770 *nodes* **102** *edges*

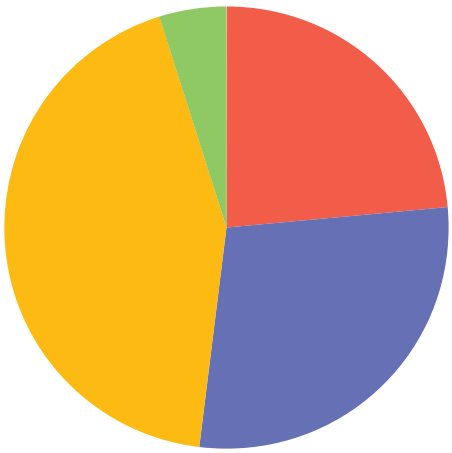
NODES

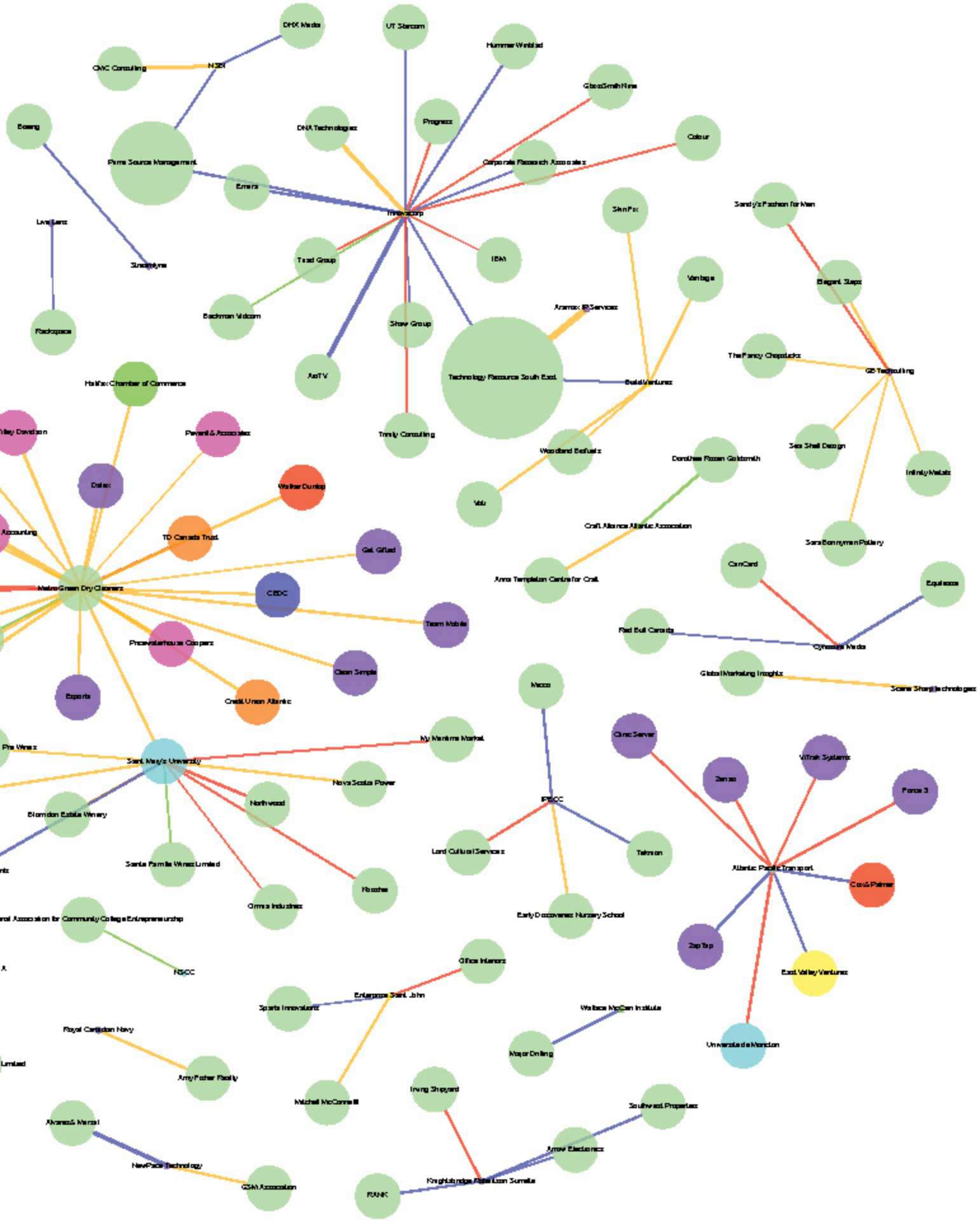
- Mature Firms
- Entrepreneurial Firm
- Support Organization
- Venture Capital/Angel Network
- Financial Institution
- University/College/Research
- Accounting Firm
- Law Firm
- Government Agency



EDGES

- Product/Service/Technical
- Business/Market/Financial
- Both
- Neither




DHX Media
UT Starcom
Hummer Winblad
CNC Consulting
N2N
GlaxoSmithKline
Boeing
DNA Technologies
Progress
Prime Source Management
Colour
Corporate Research Associates
Emera
Innovacorp
SkinFix
Sandy's Fashion for Men
LiveLens
IBM
Trad Group
Vantage
Elegant Steps
Stratodyne
Backroom Videom
Aramex IR Services
Shaw Group
Rackspace
Technology Resource South East
The Fancy Chocolatier
GS Technolink
Halifax Chamber of Commerce
AstTV
BaldVentures
Tmnly Consulting
Parent & Associates
Woodland Biofuels
Sea Shell Design
Dorothea Rosen Goldsmith
Infinity Metals
Dalac
Walker Dunlop
Yalu
Craft Alliance Atlantic Association
TD Canada Trust
Sara Bonnyman Pottery
Get Gifted
Anna Templeton Centre for Craft
CanCard
Metro Green Dry Cleaners
CEDC
Equicoco
Team Mobile
Red Bull Canada
Cynosure Media
Pricewaterhouse Coopers
Global Marketing Insights
Clean Simple
Credit Union Atlantic
Exports
Nacco
Clinic Server
Wtrak Systems
Zenso
Force 3
My Maritime Market
Saint Mary's University
Nova Scotia Power
IPECC
Northwood
Blomidon Estate Winery
Lord Cultural Services
Telerion
Atlantic Pacific Transport
Cox & Palmer
Santa Family Wines Limited
Rooster
Omnia Industries
Early Discoverers Nursery School
ZapTap
East Valley Ventures
NSCC
Office Interiors
Enterprise Saint John
Sports Innovation
Wallace McCain Institute
Royal Canadian Navy
Major Drilling
Universite de Moncton
Army Fisher Realty
Mitchell McConnell
Irving Shipyard
Southwest Properties
Alvarez & Marsal
Arrow Electronics
NewPage Technology
GSM Association
RANK

These findings precipitated writing the paper "The Role of Mature Firms in an Entrepreneurial Ecosystem" which was presented in full and in part in a number of venues including the 2017 University-Industry Innovation Network where it spawned notice from Australia, Waterloo, University of Moncton, and University of Ottawa; and the Saint Mary's University Research Expo in 2017. This paper went beyond the findings here and investigated all the various methods a mature firm can deploy to assist start-ups.

Innovating, fast-growing ventures can improve the culture of mature businesses and the mature firms stock of innovations. Gaining an eye to a start-ups' intellectual property can be a motive for mature firms interest in founders. The young firm could be the start of an innovation process for a mature firm whereby: a mature firm invests in the venture to gain a first insight into developments in the technology or discipline; or the mature firm acquires a venture to enhance their innovation inventory; or the mature firm acquires the venture to arrest the ventures' innovation or to acquire the talent and intellectual capability of the founders and employees (the so-called acquihire).

Some mature company consultations were precipitated by a former resident of the region. Acting as an intermediary, the liaison between the mature firm, universities, and business angels discussed strategies to support younger technologies. Subsequent meetings precipitated their investment in local start-up, TruLeaf in Nova Scotia, as well as several introductions to some successful tech start-ups in the area.

Mature firms also represent potential spinoffs creating more start-ups. A large number of highly industry-informed employees augments the stock of management available for start-ups and the creation of new opportunities [30]. Locales or regions that house considerable specific industrial or commercial interests (many suppliers, vendors, and employees with specific industry acumen) are inclined to have more spinoffs of employees leaving parent firms to create start-ups. The easy movement of employees from mature firms into start-ups intensifies the relationships amongst individuals and companies creating heightened affinity for alliances, cooperation and partnerships.

A parental dynamic suggests that employers that are supportive of defecting pre-founder employees gives greater lift to the former employee start-ups' performance (than those start-up founders who leave the mature firm without parental backing and encouragement) [31].

Table 16 - Possible Interventions for Mature Firms to Support Start-ups and Founders

1.	Conduct R&D by posing problems for solution by Entrepreneurial Firms by hosting open innovation invitations, competitions, or hackathons
2.	Test prototypes developed by Entrepreneurial Firms
3.	Lend engineering talent or other operational and process capabilities
4.	Donate administrative or logistic support such as boardrooms, offices, equipment, photocopiers, distribution capabilities
5.	Government policies that support in-kind contributions by Mature Firms
6.	Lend equipment, kit or resources that are difficult or expensive to acquire or purchase
7.	Donate office materials, furniture, or old equipment to accelerators, incubators or Start-ups
8.	As sources of high paid employment and stability, Mature Firms can release employees that are potential new innovators and entrepreneurs without encumbrances (Samsung, McCains, Emera, Louisburg Seafood)
9.	Accelerate Startup's commercialization by buying from or selling to Start-ups
10.	Introduce Start-ups to Mature Firm network -- suppliers, customers
11.	Provide introductions to network of industry associates
12.	Government spending/support into privately held firms contains a proviso to find ways to support the venture and entrepreneurial community
13.	Assist in rapid testing to accelerate validation
14.	Engage in customer trials
15.	Provide circumstances or logistics to assist Startups with field trials
16.	Help Start-ups identify key qualities needed for mission critical situations (i.e, document control procedures, advance assurance visits, quality consultations)
17.	Invite a Start-up to attend an industry conference with a Mature Firm employees
18.	Provide feedback for product market fit
19.	Test prototypes
20.	Emulate a customer; Act like a customer so a Start-up can get the gist of the language, needs and conversation with a larger company
21.	Put an entrepreneur on the plane with your sales group, or your technical group. Let them test the market with your team or listen how to field customer concerns
22.	Make a meeting with a mature firm of your acquaintance and a Start-up you think could benefit

Source: table created by the author

Ecosystem members need to help mature firms participate. At one point during the duration of this work, the Minister of Business said to the principal author, "What can mature firms do in the ecosystem. Can you make a list?" This precipitated the significant research paper on the role of mature firms in an ecosystem and the list in Table 15.

Support organizations, chambers of commerce, economic development agencies and universities/colleges can organize events that bring mature firms in regular contact with founders. These could take the form of hosting hackathons, hosting networking events for entrepreneurial types, or rapport-building event. The composition of these meetings might include many large firms and a collection of founders, or many founders invited by one large firm. (Regarding the latter, these events have to have talented hosts or moderators, with planned programming to avoid the following scenario described to the author. All the entrepreneurs were sitting in the room with their arms folded as the one large company tried to communicate their interest in supporting the start-up community, the idea that they were "open" to working together. Issues of having their technology and ideas stolen, insincerity, and just darn right trepidation fueled this stifling reaction by the entrepreneurs.)

8. SEEK VENTURE CAPITAL OUTSIDE OF ATLANTIC REGION

In the analysis, most of the venture capital firms that are represented in the charts are principally the alters associated with VC respondents. Not founders. Founders and their firms should be reaching out to VC outside of the Region, perhaps to specialist VCs in their technology area. Co-founders making overtures to investors outside of the region will benefit from: a) an increased breadth of their specific knowledge of financing specialties (agtech, clean tech, ICT specialists, east coast versus west coast), b) exposure to their competition, and c) helping to situate the region on the global entrepreneurial and innovation map.

The local financial alternatives are greatly generalized compared to specialists elsewhere. There is little independent private venture capital in the Atlantic Canada and many of the local funds (not all) attempt to fill financing gaps and satisfy government, or quasi-government, mandates. For some of them, their mandate has expanded to provide a supportive and mentoring capacity in the ecosystem, and to provide incubating opportunities as well. Specializing in a very small market is unviable.

When founders cultivate their capabilities, business models, value propositions, and validation with VCs outside the region, they are exposing themselves to a sophisticated audience. Undergoing the rapid-fire questioning of a group of investors who do not suffer fools lightly sharpens founders' capabilities as they clamber to develop the value propositions that conquers those of their competitors, and product market fit. A noteworthy exception in the data was a single firm that spend a great deal of time in search of capital outside the region over a period of years. New Pace Technologies was ultimately acquired by Samsung representing a winning exit for the entrepreneurs and vindicating the entrepreneur's significant efforts.

It is not an entrepreneur's role to make the region a global entrepreneurial ecosystem, however, the more they reach, the more their efforts support the rest of the network.

9. IMPROVE PEER-TO-PEER ENGAGEMENT (AND MENTORS TOO)

New venture performance is shaped by the social ties and networks that entrepreneurs form with one another [32]. A sub-section of the data (Newfoundland) reveled that there was very little peer-to-peer, founder-to-founder, knowledge-seeking inquiry in the data. The major prevalence of outreach was to support organizations, governments, etc. In Newfoundland, Blair Winsor and Ken Carter wrote, "Entrepreneurial firms in each region should consider doing more among themselves to enhance their ecosystem by taking a greater role in communicating, interacting, and supporting each other" [22].

The mentoring literature makes a distinction between peer-to-peer relationships and peer-to-mentor relationships. The age and expertise of the mentor determines the distinction. Mentors are usually older and further along in their careers than the peer-to-peer relationships which have smaller age and stage-of-development discrepancies between the pair. There is a tacit transfer of understanding about what it is like to work in an entrepreneurial firm that can be communicated by peers -- unwritten norms, attitudes, values, ways of behaving, and standards. Solutions to problems can be kicked around in a non-judgmental fashion.

At the other end of the scale, successful entrepreneurs are potential mentors for entrepreneurs. High-achieving entrepreneurial mentors possess unique credibility and social influence as they are particularly high-status entrepreneurs, and their ability to introduce mentees to financiers, senior resource holders, potential employees, and/or co-founders enhances

mentees' social prestige by association. A high-achieving mentor will be more influential in recommending mentees to intermediaries because their recommendation carries more weight, with an investor for example, than the recommendation coming from someone else. Successful mentors often pre-screen potential mentees to ensure they are working with premium talent worthy of investing their own time.

Studies of non-entrepreneurs who are exposed to entrepreneurial mentors' social influences show an increased predilection to entrepreneurial careers particularly those offspring of non-entrepreneurial parents. The incredible opportunities afforded by Ventures for Canada is built on this principle. To be clear, these influences may mean careers in entrepreneurial firms, such as working in an early-stage entrepreneurial firm, not necessarily as a founder or co-founder.

10. BEST PRACTICE WHEN IMPLEMENTING SIMILAR RESEARCH

The process of generating survey responses was easier in some locales than in others. Many different locations were selected from around the Atlantic region in order to draw upon the community knowledge and strengths of the different scholars from those locales. In some cases, there were several persons from a specific area. Cape Breton University, for example, had three scholars contributing from the Island-specific standpoint. The usefulness of this method was to exploit, as much as possible, the scholars' name recognition. The scholars would distribute the surveys from their university email addresses into the entrepreneurial community thereby taking advantage of their respect and recall from the entrepreneurial constituency

As numbers of different iterations of the dissemination transpired, it was recognized that the use of the entrepreneurship and/or business development centres was a more productive vehicle for developing populations and samples. The entrepreneurship centres and business development centres have very close working relationships with their clients that in numerous some cases that has resulted in databases of thousands of entrepreneurial clients they have worked with over the years and with whom they still maintain relationships.

In a future replication of this work, it is strongly advised that cultivating a research relationship with the regional entrepreneurship centres (McCain Institute, SMU Entrepreneurship Centre, Genesis, etc.) is a more productive method to develop populations, samples and to disseminate the surveys.

> Entrepreneurship centres make good research partners for this type of research. This finding was the subject of a presentation to a large group of entrepreneurship centres from around the globe. Hosted by SMU and Dal in 2017, participants at the Global Conference of Entrepreneurship Centres found the opportunities to participate in such compelling research a powerful proposition.

RESEARCH *Questions Raised*

This work expands the knowledge range and tools available to study entrepreneurs' inquisitiveness for innovation by applying the quantitative methodology of network theory to entrepreneurs' knowledge-search behaviours. Good data and analysis produce interesting findings that lead to new research questions. Below are enumerated a number of questions raised by the findings from the Atlantic Entrepreneurial Ecosystem Project.

NOT WHO-WAS-SOUGHT-AFTER, BUT RATHER WHO-SOUGHT INNOVATING INFORMATION?

This investigation answered the questions related to "who was sought after for information by members of the ecosystem." Who were ecosystem participants reaching out to to satisfy their curiosity. Revising all of the respondents responses to highlight the outdegree would produce charts that show us who is doing the most outreach on behalf of their businesses. The opportunity to turn the work inside out and ask "who in the ecosystem was doing the most searching for the best/or the most distant/or the most innovative etc. information" would be improved by participation from individuals in governments, support agencies, professional firms, and financiers, etc. which is harder to facilitate due to privacy considerations where responses might implicate clients.

THE RELATIONSHIP BETWEEN IMPORTANCE OF INFORMATION AND THE FREQUENCY WITH WHICH IT IS SOUGHT

It would seem likely that there would be some relationship between the frequency of information sought and the importance or value of the information to the seeker; a positive correlation. Or perhaps there is an indirect relationship, a ratio of importance to frequency could be a type of efficiency of information-seeking index – getting very valuable information from a relatively small number of requests. All of the data that was collected by the researchers involved in this study is available to those researchers. Numerous analyses were conducted on sub-sets of data by different researchers producing novel methods to consider answering questions. These analyses could be conducted on other subsets of the data by collaborating researchers, as well as exploring the frequency data that was collected.

EGOS NETWORKS HIGHLIGHT THE COMMUNITY OF NODES ASSOCIATED WITH ONE ACTOR

An egos network is the network of nodes that are associated with a specified node by any pathway. There are many interesting egos possible in a research project such as this. What about a specific university? Or a specific government agency? What about a particular venture capital fund? Who and what are the types of information flowing from, to, and around those specified nodes. Moreover, observations could be made about significant differences between the egos networks of the immigrant entrepreneurs and the domestic entrepreneurs? Or the egos networks of women versus men? Or people in NL compared to PEI?

NATIONAL AND INTERNATIONAL REACH OF THE ACTORS

In two sub-sets of the work, a finer-grained analysis was conducted which ascertained the geographic location of the respondents' and their alters. This analysis permitted a level of assessment about the reach of respondents that prompted some interesting findings about the centricity of the Atlantic Entrepreneurial Ecosystem. Would similar work in the other data sub-sets produce the same findings?

BLURRED LINES BETWEEN TECHNOLOGY AND "TRADITIONAL" ENTREPRENEURS

There is some discussion about technology entrepreneurship as compared to traditional entrepreneurship, but there is little discussion about this in the academic literature. Interestingly, what is discussed, is likely contrary to popular opinion.

In more advanced economic discussions, technology entrepreneurs' goals are described as attempts to create and increase value via innovation and they expect their returns from the sale of their equity and shares and by garnering investments [33], *not* from profits. *Successful traditional* firms, on the other hand, foster the creation of high growth firms, thus adding jobs and contributing to job creation and the policy initiatives of many governments. Traditional entrepreneurs scale their operations and seek efficiencies thereby maximizing profits to provide dividends.

The difference between the two is highlighted as the technology firms -- with little or no revenues, profits, or significant employment -- acquire returns by selling their innovations and selling their equity (or the entire firm by acquisition) for capital gains. Traditional firms, on the other hand, scale, add employees, seek more customers, work in their communities, and amongst other stakeholders in order to achieve profitability, and declare dividends to their stockholders. These descriptions are contrary to the popular ecosystem narrative.

Given these definitions, the traditional firm looks very satisfying to a policy maker. (The group known as *non-productive traditional* firms are the so-called lifestyle firms. They create employment and income for their owners principally with fewer other economic outcomes [34]. These are often mistaken for the *successful* traditional firms.)

To further complicate the issue, the advancing march of IT into virtually every business has made the lines between *successful traditional* and *technology* entrepreneurs even more imprecise. Combining technological innovation and IT in the social and economic environment stimulates traditional entrepreneurs' abilities to reach markets, engage with suppliers, know their competitors, and serve their employees. Making use of IT, social, and virtual networks, and commercialized technology allows traditional firms to have better opportunities to co-create value with their stakeholders [35], thus blurring the lines between traditional and technology entrepreneurship. This makes teasing out differences between the two groups more difficult and less revealing.

At a conference, when questioned by the author, Gerry Pond retorted, "Everyone is a technology entrepreneur now. If you use a computer, you're in technology." If an entrepreneur markets online, or meets customers on Google hangouts, are they technology entrepreneurs? When a restaurant owner wants to improve productivity with new equipment, or improve sales with a new social media campaigns, or offer delivery via Skip the Dishes, or improve productivity by leasing a vehicle that makes, cooks, cuts, and boxes the pizza with robots while on the way to the customer's residence? (Yes this is now possible with Zume, the pizza company founded in Silicon Valley.) Are they, or are they not, creating new business models facilitated by technology?

IDENTIFICATION OF WEAK OR STRONG SOURCES OF INFORMATION

In this study, knowledge-seeking behaviours were defined as actions taken by phone, in person or by email/text where a constituent of the ecosystem reached out to another individual in an effort to find information to make a decision related to an entrepreneurial firm. The source of the information sought was identified by their name and their organization. It would be useful to ascertain whether or not each communication enumerated was weak or strong, was the person who was sought a known acquaintance, or a relatively distant source of information? This information would be a useful complement to the current research and in documenting the search for innovation highlighted as most beneficial when derived from weak ties. Perhaps this might be possible in conjunction with an egos network investigation on a smaller scale.

NON-PROBABILITY SAMPLING FOR WHOLE DATA SET

One sub-section of the data was exposed to further analysis by requesting that the respondents' sources of information answer the survey as well. This required identifying, finding, and getting emails for all of the information sources enumerated by the respondents. For the sample involved, it was a time-consuming task. The purpose was to try to extend the reach of the ecosystem. Pursuing this would extend the current data's reach.

DO RURAL FOUNDERS HAVE ALTERNATIVE STRATEGIES FOR KNOWLEDGE-SEARCH FOR INNOVATION

Is there a difference between the way that rural entrepreneurs satisfy their curiosity to advance the capabilities of their businesses? In Nova Scotia, just short of half of the population lives in the Halifax Regional Municipality, and the Greater Area of St. Johns's NL represents about 35 percent of NL. Is the entrepreneurial activity driven by collision density achieved in urban areas [36] envied by rural communities and what do they do to counteract the effect. The increased rate of interactions between entrepreneurs spurs the movement of talent, creativity, opportunities and excitement amongst co-founders and ventures. The extent to which collision density and knowledge-search are related is unknown. Moreover, related concerns about the lack of Internet access in some rural regions would no doubt be influenced by this. As well, some rural regions have a large company as their nucleus and we have seen the role that mature firms can have in supporting and spurring on founders.

MARKETING ACTIVITIES *and* DISSEMINATION

Marketing activities and dissemination of the research project was a priority in order to contribute to building the insights from related persons in the ecosystem. More than 40 engagements were hosted or attended (not including visits to private organizations) throughout the duration of the project.

Approximately 960 persons were exposed to the research as it was developing; this number does not include people who may have been heard about the project by media, nor recipients of surveys. The various dissemination activities added to the research with insightful comments and questions posed by participants; the knowledge dissemination informed the study as it proceeded – a constructivist approach.

The marketing activities and dissemination took a number of forms: invited speaking engagements; conference presentations; research expos for scholars and practitioners; meetings with ecosystem constituents; newspaper and radio interviews; similar projects engaged (MaRS Discovery District); student dissertations in innovation; and research proposals submitted. The engagement of significant dissemination and discussion during the research period precipitated observations from the thousand people who saw the database as it was developing. As is common in a constructivist approach, these comments helped shape the thinking about ecosystems in general, and the Atlantic Entrepreneurial Ecosystem in particular.

Below is the list of marketing activities and dissemination (knowledge mobilization in university-parlance) in chronological order.

#	Project Type	Organizer/University	Project Title & Description	Location	Date
1	Knowledge Creation	Sobey School of Business: Working Paper Series	"Measuring and Mapping Entrepreneurial Ecosystem's Innovation Activities" E Farrell & N Dennison	Halifax, Nova Scotia	Jun-15
2	Research Presentation	Financing Technology University of Bologna	Mapping and Measuring Knowledge-Seeking Behavior in an Entrepreneurial Ecosystem	Rimini, Italy	1-Jun-15
3	Knowledge Creation	Sobey School of Business: Working Paper Series	"Opportunities for Syndication in a Government VC Dominated Entrepreneurial Ecosystem" by E Farrell	Halifax, Nova Scotia	Jun-15
4	Research Presentation	Business and Economics Society International	"Opportunities for Syndication in a Government VC Dominated Entrepreneurial Ecosystem" by E Farrell	Faro, Portugal	Jul-15
5	Knowledge Creation	Sobey School of Business; Working Paper Series	Quantitative Analysis of the Atlantic Entrepreneurial Ecosystem's Innovation Activities E Farrell & N Dennison	Halifax, NS	May, 2015
6	Research Presentation	Academy of Innovation and Entrepreneurship, National Entrepreneurship Research Center, Tsinghua University, China Technology and Management Centre for Development, Oxford University, UK Canada-China Institute for Business and Development, Ryerson University, Canada	Quantitative Analysis of the Atlantic Entrepreneurial Ecosystem's Innovation Activities E Farrell	Toronto, ON	August 20-21, 2015
7	Policy Workshop	Saint Mary's University	The Atlantic Entrepreneurial Ecosystem: A Policy Workshop to Build our Region's Entrepreneurial Economy	Halifax, Nova Scotia	September 17-18, 2015
8	Research Presentation	Saint Mary's University	Research EXPO	Halifax, Nova Scotia	22-Mar-16
9	Hosted Conference	AEE prompted Grenfell Campus's Office of Engagement to host a conference to discuss NF innovation & entrepreneurship	Entrepreneurship and Innovation: Unlocking Regional Potential: Promoting University, Government, Community and Business Collaboration to Strengthen the Region's Entrepreneurial Ecosystem	Corner Brook, NF	April 7-8, 2016
9	Speaking Invitation	Entrepreneurship and Innovation: Unlocking Regional Potential: Promoting University, Government, Community and Business Collaboration to Strengthen the Region's Entrepreneurial Ecosystem	AEE Ecosystem Study & Value of Entrepreneurial Ecosystems,E Farrell, B Winsor & K Carter	Grenfell Campus Corner Brook, NL	April 7-8 2016
10	Publicity	Cape Breton Post	"CBU research team seeks to help Cape Breton entrepreneurs be more successful"	Cape Breton, Nova Scotia	July 10 2016
11	Knowledge Creation	Sobey School of Business: Working Paper Series	"Weak Ties and Global Reach: Network Theory and the AEE" by E Farrell	Halifax, Nova Scotia	May/June 2017
12	Research Presentation	7th International Research Meeting in Business and Management(IRMBAM). Telfer School of Management – University of Ottawa, Groupe ESC Troyes en Champagne, IPAG Business School, University Nice Sophia Antipolis.	Weak Ties and Global Reach: Network Theory and The Atlantic Entrepreneurial Ecosystem. Invited Speake	Nice, France	July 11-12 2016
13	Other	With Christian Longhi, PhD, research Fellow at GREDEG, France	Meeting and tour of ecosystem Sophia Antipolis, France	Sophia Antipolis, France	12-Jul-16
14	Speaking Invitation	National Angel Capital Organization(NACO)	2016 National Angel Summit, Invited Speaker – Atlantic Entrepreneurial Ecosystem Project	Vancouver, Canada	October 4-6, 2016

15	Speaking Invitation	Canadian Federation of Business School Deans (CFBSD), SMU	CFBSD Annual Deans and Directors Meeting	Halifax, Nova Scotia	Oct 23-24, 2016
16	Other	McCain Foods, Ellen Farrell, Mike Durland, Gerry Pond, Jeff Delapp – President of MaCain Foods North America, Barry Murchie – VP Commercial Operations at McCain Foods USA	Corporate Consultation McCains head Office	Halifax, Chicago, Toronto	January, 2017
17	Research Presentation	Saint Mary's University	Research EXPO	Halifax, Nova Scotia	3-Mar-17
18	Workshop	Research Study Retreat, Grenfell Campus, Memorial University	Research Workshop on Network Theory. Attended by 3 graduate students & 5 faculty	Corner Brook, NF	April 18-19, 2017
19	Community Engagement	Memorial University, Navigate Entrepreneurship Centre (Go Engagement)	Corner Brook, St. John's Results: Network Theory and the Atlantic Entrepreneurial Ecosystem	Corner Brook, NF	20-Apr-17
20	Speaking Invitation	Smith School of Business, Queen's University	Bold Leadership: Strengthening Canadian Communities	Fogo Island, NL	May 11- 14, 2017
21	Knowledge Creation	Sobey School of Business: Working Paper Series	"The Role of Mature Firms in an Entrepreneurial Ecosystem" by E Farrell	Halifax, Nova Scotia	Jan/Feb 2017
22	Research Presentation	University Industry Innovation Network (UIIN), Trinity College	The Role of Mature Firms in an Entrepreneurial Ecosystem. University-Industry Interaction Network Conference (UIIN)	Dublin, Ireland	June 7-9, 2017
23	Community Engagement	Community Innovation & Social Enterprise Conference. Shannon School of Business, Cape Breton University	Cape Breton Results: Network Theory and the Atlantic Entrepreneurial Ecosystem. E Farrell, D Brown, K Carter, K McKeague)	Sydney, NS	July 12-14, 2017
24	Other	Association of Atlantic Universities, Department of Management Sobey School of Business Saint Mary's University	Association of Atlantic Universities Teaching Award Nomination- Ellen Farrell, PhD	Halifax, Nova Scotia	2017
25	Research Presentation	GCEC International Conference, Dalhousie University, Saint Mary's University, University of New Brunswick	Entrepreneurial Ecosystem Mapping: Benefits to Entrepreneurship Centres, Visualizing an Entrepreneurial Ecosystem	Halifax, Nova Scotia	October 12-14, 2017
26	Other	Cape Breton University meets the public to enhance research sample	Data Blitz	Sydney, NS	26-Oct-17
27	Publicity	Cape Breton Post	Cape Breton entrepreneurs asked about supports, services	Nova Scotia	24-Oct-17
28	Research Proposal	Entrepreneurship & Regional Development An International Journal.	Call for Papers – The dynamics of entrepreneurial ecosystems David Audretsch, Colin Mason, Morgan P. Miles & Allan O'Connor		9-Mar-18
29	Research Presentation	Harris Centre Applied Research Fund	Mapping Knowledge Seeking in the St. John's and Corner Brook Entrepreneurial Ecosystems	St. Johns, Corner Brook	31-Mar-18
30	Other	MaRS Discovery District	APRI work was instrumental in encouraging MaRS District to undertake a similar project.	Ontario, Canada	18 month, 2017 – 2018
31	Other	Canadian Council of Small Business & Entrepreneurship N Dennison	Research paper development workshop	Halifax, Nova Scotia	May 3-5, 2018
32	Speaking Invitation	National Angel Capital Organization (NACO)	Building a Globally Competitive Regional Ecosystem. 2018 Atlantic Regional Angel Summit	Halifax, Nova Scotia	May 28 -29, 2018
33	Other	Wallace McCain Institute Nancy Matthis, Executive Director	Collaboration with Wallace McCain Institute survey distribution in NB and Atlantic Canada.	Fredericton, NB	April/May 2018
34	Research Proposal	Waterford Institute of Technology, School of Business, Centre for Enterprise Development & Regional Economy, & Irish Network for Teachers & Researchers of Entrepreneurship (Unsuccessful)	The 2018 Babson College Entrepreneurship Research Conference	Waterford, Ireland	June 6-9, 2018
35	Other	Use at UPEI Community Engagement	How Mature Firms can Support Start-Ups: Table Cards Created	Charlottetown, PEI	11-Jun-18
36	Community Engagement	UPEI	2018 PEI Community Engagement Event. Hosted by S Graham, Ellen Farrell and Nathan Dennison	Charlottetown, PEI	11-Jun-18
37	Other	Saint Mary's University	PhD Dissertation: Ellen Farrell, Reader for Student PhD. Claudia De Fuentes (supervisor); Ryan Gibson (Reader); and Roland Martin (external examiner). Thesis in private and public innovations using network theory.	Halifax, NS	2016-2018
38	Research Presentation	People, Place & Public Engagement Conference, MUN K Carter & B Winsor	Mapping Knowledge Seeking in the St. John's and Corner Brook Entrepreneurial Ecosystems: Preliminary Findings	St. John's, NL	October 25th – 27th, 2018
39	Research Workshop	Beijing Normal University & Saint Mary's University	BNUZ-SMU Research and Academic Skill Building Symposium	Zhuhai, China	November 16 – 17, 2018
40	Community Engagement	Dr. Dannie Brown, Dean, Crandall University & Dr. Izold Guihur, Université de Moncton	NB Community Engagement: Preliminary Findings of AEE	Moncton, NB	12-Oct-18
41	Conference Presentation	Atlantic Schools of Business 2018: Université de Moncton	Preliminary Findings of AEE: K McKague, E Farrell & N Dennison	Moncton, NB	September 28 – 30, 2018
42	Speaking Invitation	NSCC Burridge Campus	Innovation Fête: Sponsored by Province of Nova Scotia N Dennison	Yarmouth, NS	23-Oct-18
43	Knowledge Creation	Abstract submitted 10th European Conference on Intangibles and Intellectual Capital I Guihur, E Farrell, N Dennison	"First glance at an innovative ecosystem to build entrepreneurial intellectual capital"	Moncton, NB	Oct-18

KNOWLEDGE CREATION:
Full Research Papers & Reports Follow

Farrell Ellen (2017). The role of mature firms in an entrepreneurial ecosystem. 2017 **University-Industry Innovation Network conference.** Dublin, June 7-9, 2017.

Winsor, Blair and Ken Carter (2018). Mapping Knowledge Seeking in the St. John's and Corner Brook Entrepreneurial Ecosystems. **Report to Harris Centre, Memorial University of Newfoundland**. Corner Brook, NF, March 31, 2018.

Farrell, Ellen (2016). Weak ties and global reach: Network theory and the Atlantic Entrepreneurial Ecosystem. **2016 International Research Meeting in Business and Management.** Telfer School of Management - University of Ottawa, Groupe ESC Troyes en Champagne, IPAG Business School, and University Nice Sophia-Antipolis. Nice, France, July 11-12, 2016.

Farrell, Ellen and Nathan Dennison (2015). Quantitative analysis of the Atlantic entrepreneurial ecosystem's innovation activities. **Academy of Innovation and Entrepreneurship**, Oxford, Ryerson and Tsinghiu University of China. Toronto, August 19-21, 2015.

Farrell, Ellen (2015). Opportunities for syndication in a government venture capital dominated entrepreneurial ecosystem. **Business and Economics Society International**. Algarve, Portugal, July 6-9, 2015.

Farrell, Ellen and Nathan Dennison (2015). Measuring and mapping knowledge-seeking behavior in an entrepreneurial ecosystem. **Financing Knowledge Transfer**, European Investment Bank and the University of Bologna, Rimini, Italy, April 16-17, 2015.

SELECTED READINGS

1. Autio, E., et al., Entrepreneurial innovation: The importance of context. Research Policy, 2014. 43(7): p. 1097-1108.
2. Alvarez, S.A. and J.B. Barney, Discovery and creation: alternative theories of entrepreneurial action. Strategic Entrepreneurship Journal, 2007. 1(1-2): p. 11-26.
3. Mason, C. and R. Brown, Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship. 2014, OECD: The Hague, Netherlands. p. 38.
4. Reynolds, P., Bosma, N., Autio, E. , et al., Global Entrepreneurship Monitor: Data collection design and implementation 1998-2003. Small Business Economics, 2005. 23(3): p. 205-231.
5. Cherven, K., Network Graph Analysis and Visualization with Gephi. 2013, Birmingham: Packt Publishing Ltd. 99.
6. Saxenian, A., Lessons from Silicon Valley. Technology Review, 1994. 97(5): p. 42.
7. Ferrary, M. and M. Granovetter, The role of venture capital firms in Silicon Valley's complex innovation network. Economy and Society, 2009. 38(2): p. 326.
8. Bahrami, H. and S. Evans, Flexible re-cycling and high-technology entrepreneurship. California Management Review, 1995. 37(3): p. 62.
9. McCann, P., How deeply embedded is Silicon Glen? A cautionary note. Regional Studies, 1997. 31(7): p. 695-703.
10. Galbraith, C.S., C.L. Rodriguez, and A.F. DeNoble, SME Competitive Strategy and Location Behavior: An Exploratory Study of High-Technology Manufacturing. Journal of Small Business Management, 2008. 46(2): p. 183-202.
11. Honig, B. and E.L. Black, The industrial revolution and beyond. Journal of Management History, 2007. 13(3): p. 269-289.
12. Ter Wal, A.L.J., Cluster Emergence and Network Evolution: A Longitudinal Analysis of the Inventor Network in Sophia-Antipolis. Regional Studies, 2013. 47(5): p. 651.
13. Moensted, M., Networking and Entrepreneurship in Small High-Tech European Firms: An Empirical Study. International Journal of Management, 2010. 27(1): p. 16-30,200.
14. Liao, J. and H. Welsch, Social capital and entrepreneurial growth aspiration: a comparison of technology- and non-technology-based nascent entrepreneurs. The Journal of High Technology Management Research, 2003. 14(1): p. 149-170.
15. Cavallo, A., A. Ghezzi, and R. Balocco, Entrepreneurial ecosystem research: present debates and future directions. International Entrepreneurship and Management Journal, 2018.
16. Soto-Rodríguez, E., Entrepreneurial Ecosystems as a Pathway towards Competitiveness: The Case of Puerto Rico. Competition Forum, 2014. 12(1): p. 31-40.
17. Cohen, B., Sustainable valley entrepreneurial ecosystems. Business Strategy and the Environment, 2006. 15(1): p. 1-14.
18. Berry, O. and D. Wassertail, Israel: the technology industry as an economic growth engine creating a nationwide cluster of innovation, in Global Clusters of Innovation, J.S. Engel, Editor. 2014, Edward Elgar Publishing: Cheltenham. p. 409.
19. Schönenberger, H., Germany: high tech region Munich generating the next wave of scalable startups, in Global Clusters of Innovation, J.S. Engel, Editor. 2014, Edward Elgar Publishing: Cheltenham. p. 409.
20. De Waele, W. and S.H. De Clen, Belgium: building a digital cluster of innovation in the heart of Europe, in Global Clusters of Innovation, J.S. Engel, Editor. 2014, Edward Elgar Publishing: Cheltenham. p. 409

21. Wen, C.-T. and J.-M. Chen, Taiwan: linkage-based clusters of innovation -- the case of Taiwan's IT industry, in Global Clusters of Innovation J.S. Engel, Editor. 2014, Edward Elgar Publishing: Cheltenham. p. 409.
22. Winsor, B. and K. Carter, Mapping Knowledge Seeking in the St. John's and Corner Brook Entrepreneurial Ecosystems. 2018, Harris Centre Memorial University: St. Johns p. 29.
23. Bresnahan, T., A. Gambardella, and A. Saxenian, 'Old economy' inputs for 'new economy' outcomes: Cluster formation in the new Silicon Valleys. Industrial and Corporate Change, 2001. 10(4): p. 835-860.

24. Engel, J.S. and I. del-Palacio, Global Clusters of Innovation: The Case of Israel and Silicon Valley. California Management Review, 2011. 53(2): p. 27-49.
25. Farrell, E., Weak ties and global reach: network theory and the Atlantic entrepreneurial ecosystem, in International Research in Business and Management. 2016: Nice, France.
26. Granovetter, M.S., The strength of weak ties. American Journal of Sociology, 1973. 78: p. 1360 - 1380.
27. Burt, R.S., Structural holes and good ideas. The American Journal of Sociology, 2004. 110(2): p. 349 - 400.
28. Engel, J.S. and I. del-Palacio, Global networks of clusters of innovation: Accelerating the innovation process. Business Horizons, 2009. 52(5): p. 493.
29. Engel, J.S. and F. Forster, USA: Silicon Valley, the Archetypal Cluster of Innovation, in Global Clusters of Innovation: Entrepreneurial Engines of Economic Growth Around the World, J.S. Engel, Editor. 2014, Edward Elgar Publishing: Cheltenham, UK. p. 41 - 92.
30. Garvin, D.A., Spin-offs and the new firm formation process. California Management Review, 1983. January: p. 3-20.
31. Dyck, B., Exploring organizational family trees. Journal of Management Inquiry, 1997. 6: p. 222-233.
32. Stam, W. and T. Elfring, Entrepreneurial ecosystems and regional policy: a sympathetic critique. European Planning Studies, 2008. 23(9): p. 1759-1769.
33. Ismail, K., M.H. Sohel, and U.N. Ayuniza, Technology social venture: A new genréof social entrepreneurship? Procedia - Social and Behavioral Sciences, 2012. 40: p. 429-434.
34. Stough, R.R., Entrepreneurship and Regional Economic Development: Some reflections. Investigaciones Regionales, 2016(36): p. 129-150.
35. Shams, S.M.R. and H.R. Kaufmann, Entrepreneurial co-creation: a research vision to be materialised. Management Decision, 2016. 54(6): p. 1250-1268.
36. Nyland, P.A. and B. Cohen, Collision density: driving growth in urban entrepreneurial ecosystems. International Entrepreneurship and Management Journal, 2017. 13(3): p. 757-776.

SURVEY:
Example from Corner Brook, Newfoundland and Labrador.

Entrepreneurial Ecosystem Survey

Entrepreneurial Ecosystems: mapping the extent, roles, and effects in St. John's and Corner Brook

Researchers: Dr. Blair W. Winsor, Faculty of Business Administration, Memorial University; b.winsor@mun.ca; (709) 864-4007; Mr. Ken Carter, Director, Grenfell Office of Engagement, Memorial University Grenfell Campus; kcarter@grenfell.mun.ca; (709) 637-6265; and, Dr. Ellen Farrell, Sobey School of Business, Saint Mary's University; Ellen.Farrell@smu.ca ; (902) 420 5693.

You are invited to take part in a research project entitled *"*Entrepreneurial Ecosystems: mapping the extent, roles, and effects in St. John's and Corner Brook*"*.

This form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. It also describes your right to withdraw from the study. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able to make an informed decision. This is the informed consent process. Take time to read this carefully and to understand the information given to you. Please contact either of the researchers, Dr. Blair Winsor or Mr. Ken Carter, if you have any questions about the study or would like more information before you consent.

It is entirely up to you to decide whether to take part in this research. If you choose not to take part in this research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

Introduction:
Dr. Winsor is an Assistant Professor in the Faculty of Business Administration at Memorial's St. John's campus and Mr. Carter is the Director of the Grenfell campus Office of engagement and a PhD student. This research is funded by the Harris Centre.

Purpose of study:
The purpose of this research is to map the entrepreneurial ecosystems or startup communities in St. John's and Corner Brook. Specifically, we will identify who are ecosystem members (i.e. businesses, organizations, etc.; not the names of any individuals), where they go for their business and technical knowledge, and analyze these to better understand knowledge flows with a view to suggesting improvements to business, government, and other stakeholders in the entrepreneurial community. Overall this work will, we hope, lead to a detailed and deeper understanding of the nature and extent of the ecosystems in St. John's and Corner Brook. We may also compare these ecosystems to those in other Atlantic provinces to further increase our understanding.

What you will do in this study:
We would like you to complete the attached survey.

Length of time:
We anticipate that the survey should take no longer than 20 minutes for you to complete.

Withdrawal from the study:
You may withdraw from the research at any time prior to October 31st, 2016 and your survey response will be deleted from the data.

Possible benefits:
We hope the insights provided by this work will allow us to make recommendations for strengthening the two ecosystems which in turn would enhance economic development in NL.

Possible risks:
We do not think there are any physical, psychological, social, reputational, competitive, or financial risks to your participation. However, if you think there would be a risk please do not complete this survey or answer only those questions which are risk free.

Confidentiality:
Our ethical duty is to ensure your confidentiality; we will therefore store the data from the completed surveys on secure servers with access limited to researchers only.

Anonymity:
Every reasonable effort will be made to ensure your anonymity; while the researchers will know your identity, your identity will be anonymized on any publicly available information.

Storage of Data:
All data will be stored on internally accessible firewalled servers on Memorial's and St. Mary's University (SMU) campuses, with file access restricted to the researchers with additional access only granted as required to other researchers (e.g. student research assistant). Your data will be kept for a minimum of five years, as required by Memorial University's policy on Integrity in Scholarly Research." We may retain the data longer than 5 years for the purposes of further research.

Reporting of Results:
We anticipate publishing this research in public dissemination session(s), Harris Centre report, and in scholarly journal(s). In all of these publications the data will be anonymized and you will not be identifiable.

Sharing of Results with Participants:
As a participant in this research you will be invited to any public information sessions and sent copies of any published reports.

Questions:
You are welcome to ask questions at any time before, during, or after your participation in this research. If you would like more information about this study, please contact: Dr. Blair W. Winsor, Faculty of Business Administration, Memorial University; b.winsor@mun.ca; (709) 864-4007; and/or, Mr. Ken Carter, Director, Grenfell Office of Engagement, Memorial University Grenfell Campus; kcarter@grenfell.mun.ca; (709) 637-6265; and/or, Dr. Ellen Farrell, Sobey School of Business, Saint Mary's University; Ellen.Farrell@smu.ca ; (902) 420 5693.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as the way you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Consent:
By completing this survey you agree that:

- You have read the information about the research.
- You have been advised that you may ask questions about this study and receive answers prior to continuing.
- You are satisfied that any questions you had have been addressed.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw participation from the study by closing your browser window or navigating away from this page, without having to give a reason and that doing so will not affect you now or in the future.
- You understand that you may decide not to participate in this survey.
- You understand that you may choose to only answer some questions, skipping others.
- You understand that if you choose to withdraw, you may request that your data be removed from the study by contacting the researcher at any time prior to October 31st 2016.

By consenting to this online survey, you do not give up your legal rights and do not release the researchers from their professional responsibilities.

Please retain a copy of this consent information for your records.

Sending us the completed survey constitutes consent and implies your agreement to the above statements.

Entrepreneurial Ecosystem Survey

Name: _____ **Location:**_____

Organizational Affiliation(s):_____

Gender: _____

Prefer not to answer ☐

Age: ○ 18-25 ○ 26-35 ○ 36-45 ○ 46-65 ○ 66+

Are you an Aboriginal person? ○ Yes ○ No ○ Prefer not to answer

Level of Education (select all appropriate):

- ☐ High school or equivalent
- ☐ Vocational/technical school (2 year)
- ☐ Some college
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Doctoral degree
- ☐ Professional degree (MD, JD, etc.)
- ☐ Other (please specify):_____

At this moment, do you consider yourself a(n) (select all appropriate):

- ☐ Entrepreneur
- ☐ Social entrepreneur
- ☐ Venture capitalist
- ☐ Private individual investor
- ☐ Member of a business angel network
- ☐ Lawyer
- ☐ Accountant
- ☐ Government representative
- ☐ Consultant
- ☐ Journalist
- ☐ Professor
- ☐ Employee in a mature company
- ☐ Research laboratory employee
- ☐ Banker
- ☐ Other (please specify): _____

How many years of experience do you have in the area? _____

If you have identified as an entrepreneur above:

In what year did you first register your company with the Province?_____

In which industry or sector does your business operate?

_____

At what stage of development is your entrepreneurial venture?_____

SURVEY INSTRUCTIONS

For the remainder of the study, we ask you to recall the organizations and persons with whom you initiated conversations relative to start-ups or entrepreneurial firms. We are only concerned with individuals with whom you initiated a discussion or sought their advice.

For the following pages:

- A **Communication** includes: a person-to-person meeting; or an email initiated by you; or a phone call; or Skype call.
- Only consider communications that you initiated **in the past 12 months**.
- Some **examples** of organizations, companies and agencies are provided only to facilitate your recall. Please add as many others as are appropriate. Add the names of entrepreneurial firms from which you might have sought information.
- The **Individual Name** that you provide is used to fully develop the ecosystem's reach and to chart the inbound and outbound communications' flows. It is confidential.
- The **Average Frequency of Communications** is the estimate of the average number of times you initiated conversations with that individual in the past year.
- The **Average Importance of Communications** is the average importance you attributed to the information you were seeking. Using a scale of 1 to 7:

  "Average importance of communications ...
  1. ...a very low level of importance to the information sought.
  2. ...a low level of importance to the information sought.
  3. ...a moderate level of importance to the information sought.
  4. ...a fair level of importance to the information sought.
  5. ... a high level of importance to the information sought.
  6. ... a very high level of importance to the information sought.
  7. ... an exceptionally high level of importance to the information sought.

- The **Nature of Communication** reported has two options. Product/Service/Technical or Business/Market/Financial. Select one, or both, or neither of these categories as appropriate.
- The organizations and discussions initiated by you can be to anyone in the world.

Thinking about the past year, please recall persons and conversations that ***you initiated*** with ***agencies*** where you sought information about start-up or entrepreneurial firms or decisions. List as many as necessary.

Examples of such agencies might include (but are not limited to): ACOA, BDC, RDC, ...

Name(s) of Agencies:	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thinking about the past year, please recall persons and conversations that ***you initiated*** with **entrepreneurial firms** where you sought information about decisions you were required to make. List as many as necessary.

Name(s) of Entrepreneurial Firms:	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thinking about the past year, please recall persons and conversations that ***you initiated*** with **business angel networks, VC firms** where you sought information about decisions you had to make. List as many as necessary.

Examples of such organizations might include (but are not limited to): Killick Capital, Pelorus Venture Capital Limited, Stonehedge Capital, ...

Name(s) of Business Angel Networks or VC Funds:	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
________	________	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thinking about the past year, please recall persons and conversations that ***you initiated*** with **support organizations** where you sought information about start-ups or entrepreneurial firms or decisions. List as many as necessary.

Examples of such organizations might include (but are not limited to): CBDC, Common Ground, Futurepreneurs, Metro Business Corporation, NLOWE, Propel ICT, Startup NL, ...

Name(s) of Other Initiatives:	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thinking about the past year, please recall persons and conversations that ***you initiated*** with **financial institutions/ investment banks** where you sought information about start-up or entrepreneurial firms or decisions. List as many as necessary.

Examples of such organizations might include (but are not limited to): Bank of Montreal, BDC, CIBC, Credit Union, RBC, Scotia Bank, ...

Name(s) of Financial Institutions/ Investment Banks:	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thinking about the past year, please recall persons and conversations that **you initiated** with **universities and research organizations** where you sought information about start-ups or entrepreneurial firms or decisions. List as many as necessary.

Examples of such organizations might include (but are not limited to): CNA, MI, MUN, ...

Name(s) of Universities and Research Organizations':	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____________	____________	______	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thinking about the past year, please recall persons and conversations that ***you initiated*** with **accounting & law firms** where you sought information about entrepreneurial firms or start-ups decisions. List as many as necessary.

Examples of such organizations might include (but are not limited to): Cox & Palmer, Ernst and Young, Grant Thornton, KPMG, Mandy Woodland Law, McInnes Cooper, Poole Althouse, Pricewaterhouse Coopers, Stewart McKelvey, ...

Name(s) of Accounting & Law Firms:	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
			1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thinking about the past year, please recall persons and conversations that ***you initiated*** with **government departments** where you sought information about start-ups or entrepreneurial firms or decisions. List as many as necessary.

Examples of such organizations might include (but are not limited to): AES, BTCRD, ISED, …

Name(s) of Government Departments:	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial
____	____	____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	☐ Product/Service/Technical ☐ Business/Market/Financial

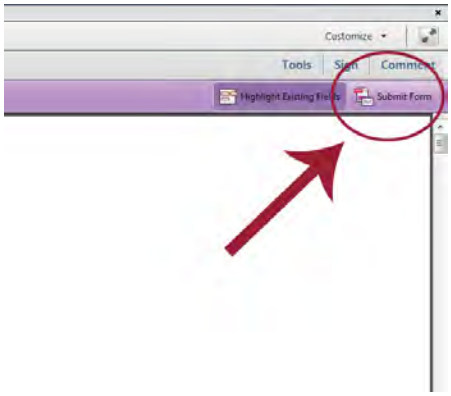
Thinking about the past year, recall decisions or business arrangements which were associated with start-ups or entrepreneurial firms. Please recall persons and conversations that ***you initiated*** with **any other organization** or mature companies where you sought information about start-up or entrepreneurial firms or decisions. List as many as necessary.

Any Other Organization/ Affiliation (if Any):	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 – Low; 7- High)	Type of Communication
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial
______________	______________	______	1 2 3 4 5 6 7 ○○○○○○○	☐ Product/Service/Technical ☐ Business/Market/Financial

Thank You for filling out the survey. Please refer to the next page for return methods.

Return Methods

1. **Submit via Adobe Acrobat/Reader:**
    a. complete questionnaire in Adobe Reader,
    b. click on the "submit" button in the top right corner as depicted in the screen capture below and follow the directions Adobe provides.



2. **E-Mail:**
    a. complete questionnaire in Adobe Reader,
    b. save completed .pdf document as EntrepreneurialNetworksSurvey_YOUR_Name.pdf (where "YOUR_NAME" is replaced by your first and last name),
    c. send an e-mail to **kcarter@grenfell.mun.ca** with the .pdf file as an attachment.

3. **Mail (Canada Post):**
    a. complete questionnaire in Adobe Reader,
    b. print the completed .pdf document

    OR

    c. print the uncompleted .pdf document,
    d. complete questionnaire in blue or black ink,

    THEN

    e. mail the printed document to:

    Dr. Ken Carter, Director,
    Grenfell office of Engagement
    Memorial University of Newfoundland
    Corner Brook, NL
    A2H 5G4

DETAIL:
Papers & Reports

87