

L'écosystème entrepreneurial de l'Atlantique : dynamique et aspirant à l'échelle mondiale

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SOMMAIRE

Les relations sont importantes. Elles sont importantes parce que l'innovation n'arrive pas seule et les possibilités entrepreneuriales ne sortent pas de nulle part. L'innovation et les possibilités entrepreneuriales dépendent de la curiosité des fondateurs. Les relations sont importantes lorsque les fondateurs cherchent des possibilités d'améliorer le rendement de l'entreprise et les retombées pour l'entreprise. La curiosité amène les entrepreneurs à découvrir des compétences complémentaires et des ressources qui les aident à accéder à de nouvelles idées générées par des personnes qu'ils ne connaissaient pas. La mesure dans laquelle les entrepreneurs sont prêts à nouer des relations en approchant d'autres organisations pour obtenir de l'information novatrice en vue de perfectionner les aspects opérationnels et techniques de leur entreprise améliore leurs perspectives d'avenir et, en fin de compte, améliore également celles de l'écosystème. La présente recherche enquête sur les démarches entreprises par les entrepreneurs pour nouer des relations dans le but d'améliorer leurs affaires et définit les frontières géographiques et numériques d'un écosystème entrepreneurial.

La présente recherche est pratique et fondée sur des données probantes. Les résultats ne proposent pas de théorie, mais présentent plutôt des observations utiles qui sont abordées dans le contexte d'autres écosystèmes entrepreneuriaux. Cette recherche n'a pas été réalisée dans une tour d'ivoire et n'est pas destinée à être tablettée; elle a prouvé sa pertinence par l'entremise des plus de 1 000 personnes qui y ont déjà participé pendant son élaboration. Enfin, elle est fondée sur des données probantes obtenues auprès de personnes au sein de l'écosystème qui ont été interrogées sur leurs activités de quête d'information. Elle dresse également un vaste tableau régional grâce aux données recueillies auprès de 1 666 organisations et portant sur 3 397 exemples de quête d'information.

Constatations

Dans le cadre de ce vaste projet de recherche, on a enquêté sur la curiosité des participants au sein d'un écosystème entrepreneurial et établi un schéma des personnes qui ont fait des démarches pour obtenir de l'information et des organisations avec lesquelles elles ont communiqué à cette fin. Pour ce faire, on a enquêté sur les comportements de quête d'information et on a eu recours à la

théorie des réseaux pour montrer la répartition des activités de quête d'information. On présente ainsi le contexte et on examine les actions des personnes au sein de l'écosystème, plutôt que de se pencher sur l'entreprise ou l'entrepreneur.

Il ne s'agit pas d'une étude pour déterminer qui connaît qui. Il ne s'agit pas d'une étude sur les réseaux sociaux. Il ne s'agit pas d'une étude sur les comptes LinkedIn, ou sur les relations sur Twitter, Facebook ou Instagram. L'étude n'a pas été créée à l'aide de mégadonnées. Il s'agit d'une enquête bâtie avec soin à l'aide de données de sondage qui ont permis de déterminer qui est prêt à établir des relations pour innover dans l'écosystème entrepreneurial du Canada atlantique.

1. COMPLEXITÉ DES ACTIVITÉS DE QUÊTE D'INFORMATION

Les activités de quête d'information de l'écosystème entrepreneurial de l'Atlantique (EEA) sont très complexes. Au total, 1 666 organisations sont représentées dans ce travail et 3 397 activités distinctes de quête d'information sont définies. Cinquante-sept pour cent des nœuds dans l'EEA représentent des entreprises, tant innovantes que matures. Les organisations de soutien (14 %) forment le deuxième groupe en importance dans l'écosystème. Les organisations financières sont des capitaux de risque, des investisseurs providentiels et des banques, et constituent 11 % des éléments approchés par les répondants. Les universités représentent 4 % des nœuds, pour un total d'environ 31 établissements d'études supérieures. L'Université d'Éthiopie en fait partie. Les participants de l'EEA ont tissé des liens jusqu'à l'Université d'Éthiopie pour bâtir le savoir nécessaire à leurs activités commerciales. Les gouvernements fédéraux et provinciaux de différents types et les entreprises professionnelles représentent la majeure partie des autres organisations nommées.

Les principaux groupes sont homogènes, mais ils sont hétérogènes les uns par rapport aux autres. Les différents groupes agissent en complémentarité, délibérément ou non, pour accomplir le mandat des écosystèmes, soit créer de nombreuses interactions cohésives.

2. LA FORCE DU NOMBRE

Lorsque tous les grands groupes mentionnés plus tôt sont en place, l'EEA en tire des avantages. Les mesures associées à un sous-groupe de données montrent que l'efficacité des comportements de quête d'information (comportements de curiosité) diminue lorsqu'on retire l'un des grands éléments. La valeur supplémentaire que chaque groupe apporte à l'écosystème montre la synergie au sein du groupe rassemblant entrepreneurs, gouvernements, groupes de soutien, professionnels et sociétés de capital risque. Si on retire l'un ou l'autre de ces groupes d'acteurs, le degré moyen des comportements de quête d'information diminue. Les gouvernements n'agissent pas seuls pour mettre en place un écosystème entrepreneurial ni ne donnent pareil mandat; l'écosystème existe plutôt grâce à l'ensemble des contributions à la création de valeur de différents acteurs.

3. L'INFORMATION COMMERCIALE, FINANCIÈRE ET SUR LES MARCHÉS DOMINE LES ACTIVITÉS DE QUÊTE D'INFORMATION

Les participants de l'écosystème cherchent principalement de l'information commerciale, financière et sur les marchés plutôt que de l'information technique et sur les produits. Il est surprenant de constater cet important écart entre les deux types d'information, et ce pourrait même être inquiétant, puisque la création de nouveaux produits repose sur la science, la technologie, le génie et les mathématiques et est tout aussi nécessaire que la création de modèles d'affaires.

Si les entrepreneurs sont compétents en création, en conception et en production de produits ainsi qu'en sciences et que leurs besoins sont fortement liés au développement de marchés, à la livraison, aux techniques de vente et aux méthodes pour bâtir une entreprise, nous sommes rassurés par le fait qu'ils cherchent plutôt de l'information commerciale. Toutefois, si les entrepreneurs n'ont pas les ressources techniques et les ressources en conception et en création nécessaires pour créer des produits durables et novateurs, et qu'ils utilisent leur temps pour chercher des conseils commerciaux, les résultats pourraient être problématiques.

4. UN ÉCOSYSTÈME CENTRÉ SUR L'ATLANTIQUE NUIT AU SUCCÈS À L'INTERNATIONAL

L'interdépendance des groupes qui constituent l'EEA est largement illustrée dans la recherche. Environ 75 % des activités de quête d'information de l'écosystème se situent dans la région de l'Atlantique. Quinze pour cent des nœuds sont dans le reste du Canada, et neuf pour cent se trouvent aux États-Unis. Un pour cent se situait ailleurs sur la planète, à l'extérieur de l'Amérique du Nord.

Il est difficile de savoir si le résultat de 25 % à l'extérieur du Canada atlantique est raisonnable ou non. En effet, il n'existe aucune étude semblable avec laquelle comparer ce résultat, exception faite de comptes rendus anecdotiques d'autres pôles d'innovation et écosystèmes entrepreneuriaux performants. Puisque la région est plus proche de l'Europe que tout autre endroit en Amérique du Nord, on ne peut s'empêcher d'être surpris qu'il n'y ait pas davantage d'éléments de l'écosystème qui nouent des relations en Europe (catégorie Reste du monde). Puisque nous sommes isolés par rapport au reste de l'Amérique du Nord, il semble raisonnable que la population du Canada atlantique établisse davantage de relations avec des pays se trouvant à une plus grande distance.

Les écosystèmes qui sont trop repliés sur eux-mêmes causent du « désentrepreneuriat », terme utilisé pour décrire les communautés qui adoptent une orientation de repli sur soi plutôt que d'ouverture vers l'extérieur dans un monde en pleine mondialisation. Les éléments qui sont ouverts sur le monde sont un remède au « désentrepreneuriat », puisqu'ils tissent des liens dans des lieux éloignés et évitent de compter seulement sur le savoir local ou de respecter uniquement les politiques locales.

6. ASPIRATION À LA RECONNAISSANCE MONDIALE

Les pôles d'innovation les plus performants ont établi de nombreux liens à l'échelle mondiale. Ou peut-être est-ce l'inverse? Les écosystèmes qui ont établi le plus de liens à l'échelle mondiale sont les plus performants. Les relations à l'international jettent un pont entre les frontières, comblent les lacunes structurelles et construisent des réseaux. Les écosystèmes qui ont des aspirations mondiales coopèrent pour cultiver des relations durables les uns avec les autres dans le but d'améliorer leurs ressources, de tirer parti de l'information, d'accéder à des marchés et d'accélérer l'innovation. Les relations à l'international encouragent la mobilité des ressources humaines entre les entreprises et les régions, favorisent le transfert de savoir-faire en haute technologie, encouragent la création d'entreprises qui se lancent à l'international dès leur création (born-global), augmentent la participation de groupes de soutien spécialisés au croisement des activités et des ressources, stimulent la mobilité des ressources humaines entre l'industrie et le milieu universitaire, et engendrent une connaissance pointue des mécanismes de soutien en permettant d'apprendre les uns des autres et de mettre à profit l'expérience.

Si les écosystèmes et les pôles d'innovation qui réussissent le mieux se distinguent par leur portée internationale et que nous les connaissons, eux sont-ils au courant de notre existence? Le Canada atlantique a beaucoup à promouvoir : un écosystème actif et motivé, des entrepreneurs et fondateurs intelligents et talentueux, une foule d'universités et de connaissances axées sur la science et les affaires, et une abondance d'entrepreneurs qui se sont retirés avec succès. Le monde se précipite à notre porte pour acheter des capitaux propres au Canada atlantique. Voici une liste non exhaustive des entreprises qui ont acheté des fondateurs et investisseurs du Canada atlantique : Lynda.com (Compiler), Salesforce.com (Radian6 et Go Instant), IBM (Q1 Labs), Verisk Analytics (Analyze Re), Samsung (Pace Technologies), Venor (Equals6), AOL (Info InterActive), Patron Technology (Marcato Digital Solutions), American Forest Foundation (WoodsCamp), Croda International, R.-U. (Nautilus Biosciences Canada), Towers Warson (Brovada), Foto Search (CanStockPhoto), Royal DSM (Ocean Nutrition), Legado Capital (Kivuto Solutions), Allied Universal (Source Security and Investigations), Vinci Energies, France (ADM Systems Engineering), Quintiles IMS (STI Technologies), Gaming Labs International (Bullet Proof).

Les acteurs de l'écosystème peuvent élargir les relations et la promotion auprès d'écosystèmes extra-locaux :

- Établir de nouveaux liens internationaux avec d'autres écosystèmes;
- Créer une coordination régulière du transfert de connaissances avec d'autres écosystèmes pour forger de nouvelles relations régionales;
- Créer et coordonner des « campagnes » pour faire connaître l'écosystème de l'Atlantique et son nombre croissant de fondateurs et d'investisseurs performants;
- Maintenir l'activité pour faire connaître davantage le Canada atlantique;
- Combiner les ressources pour participer à des missions commerciales et à des salons professionnels avec le mandat de cultiver la promotion de l'écosystème entrepreneurial de l'Atlantique;
- Trouver des « équivalents » professionnels dans d'autres provinces ou pays avec qui communiquer et demeurer en contact;
- Recruter et transmettre de l'information dans un écosystème donné, comme la Caroline du Nord, Boston, Londres, Chicago, Israël ou la Belgique.

5. ADOPTER UNE ATTITUDE DE QUÊTE D'INFORMATION QUI S'ÉTEND JUSQU'AUX LIENS FAIBLES

Quand on compte sur le savoir local et les amis proches, on

dit qu'il s'agit de liens forts. Les liens faibles sont des sources provenant de connaissances que l'acteur ne connaît pas bien, voire pas du tout. Ils peuvent s'être rencontrés à une conférence, ou il peut s'agir d'un expert que la personne a approché sans le connaître. Approcher des liens faibles (pas des collègues proches, des amis ou des membres de la famille) pour obtenir des renseignements contribue à alimenter l'innovation. Les personnes qui établissent des contacts à l'extérieur de leur cercle d'influence jettent des ponts entre les frontières et réunissent divers domaines, ce qui augmente la probabilité de tirer des bénéfices immenses grâce à la pensée innovatrice. Les liens faibles permettent aux gens d'analyser des renseignements sur divers sujets et apportent des opinions différentes et des perspectives éclairées à leur création ou initiative. En évitant de suivre les pistes et préceptes de ses liens forts, Greg Curwin de TruLeaf a importé du Japon le concept de l'agriculture verticale. Greg a passé quelques années à convaincre ses liens forts, mais les personnes à l'extérieur de son cercle d'influence normal (liens faibles) ont cru au système et ont investi pour créer une entreprise canadienne réellement novatrice qui a actuellement une forte valeur et qui croît rapidement.

7. PARTICIPATION DES ENTREPRISES MATURES À L'ÉCOSYSTÈME

Un examen d'un sous-groupe d'entreprises innovantes a révélé qu'il y a très peu d'interaction avec les entreprises matures de l'écosystème. Bien qu'elles soient qualifiées de matures, ces entreprises peuvent être plutôt petites, mais elles constituent des éléments stables à long terme de la communauté d'affaires. Les entreprises matures peuvent aussi être de grandes sociétés cotées en bourse. Les grandes entreprises ou les entreprises matures ont joué un rôle important à Israël, dans la Silicon Valley et à Sophia Antipolis.

Le mélange et le recyclage des talents parmi les entreprises matures et les jeunes entreprises génèrent un roulement du savoir qui profite aux deux parties. Les entreprises matures et bien établies peuvent offrir du mentorat aux aspirants entrepreneurs axés sur la technologie, contribuer à adapter les modèles d'affaires, mettre à l'essai les technologies, et améliorer et élaborer des pratiques de gestion. De leur côté, les entreprises innovantes à croissance rapide peuvent améliorer la culture des entreprises matures et proposer des innovations pour leurs systèmes, leurs processus et leurs produits.

Les entreprises matures, sans nécessairement être de grandes entreprises, sont sûres et bien établies, et font du commerce à proximité géographique de l'écosystème. Sciemment ou sans le savoir, les entreprises matures contribuent aux liens de réseautage en catalysant la mobilité des ressources et en accélérant les

processus de mise à l'essai et de commercialisation. Elles favorisent la diffusion du savoir sur le démarrage d'entreprise et des pratiques commerciales grâce à ce qu'elles offrent par l'entremise de capitaux, à la façon dont elles appuient les processus d'innovation, à leur rang qui favorise les déplacements fréquents des ressources humaines partout dans l'écosystème, et à une collaboration enrichissante. Des encouragements modestes d'entreprises matures peuvent offrir des possibilités exceptionnelles aux fondateurs émergents, et les entreprises qui en sont à leurs tout débuts tirent avantage à tisser des liens étroits avec les entreprises performantes à croissance rapide et à obtenir du mentorat de leur part.

D'autres mesures de soutien pouvant être offertes par les entreprises matures ont été étudiées dans le cadre de la recherche.

Interventions des entreprises matures visant à appuyer les entreprises en démarrage et les fondateurs

1.	Effectuer de la R&D en présentant des problèmes devant être résolus par les entreprises innovantes par l'entremise d'invitations ouvertes à l'innovation, de concours ou de marathons de programmation.
2.	Mettre à l'essai des prototypes mis au point par des entreprises innovantes.
3.	Prêter des talents en génie ou d'autres ressources de nature opérationnelle ou de processus.
4.	Offrir du soutien administratif ou logistique, comme des salles de conférence, des bureaux, du matériel, des photocopieurs, des ressources en distribution.
5.	Mettre en place des politiques gouvernementales qui favorisent les contributions en nature de la part des entreprises matures.
6.	Prêter du matériel, des trousseaux ou des ressources qui sont difficiles à acquérir ou à acheter ou qui sont coûteux.
7.	Donner des fournitures de bureau, des meubles ou du vieux matériel aux accélérateurs, aux incubateurs ou aux entreprises en démarrage.
8.	En tant que sources d'emplois bien rémunérés et de stabilité, les entreprises matures peuvent libérer les employés qui pourraient devenir de nouveaux innovateurs et entrepreneurs sans que cela gêne leurs activités (Samsung, McCain, Emera, Louiburg Seafood).
9.	Accélérer la commercialisation des entreprises en démarrage en se procurant des produits ou services auprès d'elles ou en leur en vendant.
10.	Présenter des entreprises en démarrage au réseau d'une entreprise mature (fournisseurs, clients).
11.	Offrir des présentations au réseau d'associés de l'industrie.
12.	Les dépenses ou le soutien du gouvernement destinés aux entreprises privées comportent une clause conditionnelle pour trouver des façons d'aider la communauté des jeunes entreprises et des entreprises innovantes.
13.	Contribuer à la mise à l'essai rapide pour accélérer la validation.
14.	Participer à des essais auprès de la clientèle.
15.	Offrir des détails ou de la logistique pour aider les entreprises en démarrage à effectuer des essais sur le terrain.
16.	Aider les entreprises en démarrage à déterminer les principales qualités requises pour les situations critiques liées aux missions (p. ex. procédures de contrôle des documents, visites d'assurance préalables, consultations relatives à la qualité).
7.	Inviter une entreprise en démarrage à assister à une conférence de l'industrie avec des employés d'une entreprise mature.
18.	Formuler des commentaires sur la correspondance produit-marché.
19.	Mettre à l'essai les prototypes.
20.	Agir comme un client afin que l'entreprise en démarrage puisse comprendre les bases du langage et des besoins des grandes entreprises ainsi que la façon de dialoguer avec elles.
21.	Faire voyager un entrepreneur dans le même avion que votre groupe des ventes ou que votre groupe technique. Le laisser tester le marché avec votre équipe ou écouter comment répondre aux préoccupations des clients.
22.	Organiser une rencontre entre une entreprise mature que vous connaissez et une entreprise en démarrage qui pourrait en tirer profit.

8. RECHERCHE DE CAPITAL RISQUE À L'EXTÉRIEUR DE LA RÉGION DE L'ATLANTIQUE

La plupart des activités de quête de savoir menées auprès de sociétés de capital risque de l'extérieur du Canada atlantique ont été réalisées par des sociétés de capital risque de la région, et non par des entrepreneurs. Le petit capital de risque privé et indépendant du Canada atlantique est appuyé par la grande portée des sociétés de capital risque, qui apportent des capitaux supplémentaires avec syndication. Beaucoup des fonds locaux (pas tous) sont des capitaux de risque subventionnés par le gouvernement qui visent à combler les lacunes financières et à remplir des mandats gouvernementaux ou quasi-gouvernementaux. Le mandat de certains fonds de capital risque consiste également à fournir du soutien et du mentorat dans l'écosystème et à offrir des possibilités d'incubation. Ces activités connexes devancent la spécialisation qui, dans les très petits marchés, n'est pas viable.

La nature de notre marché fait en sorte qu'il incombe aux entrepreneurs de passer plus de temps là où se trouvent leurs marchés, avec leurs clients, à la vue de leurs concurrents, et à la recherche d'éventuelles possibilités de financement. Lorsque les fondateurs entrent en contact avec des sociétés de capital risque à l'extérieur de la région, notamment des sociétés se spécialisant dans leur domaine technologique, ils dénotent une ingéniosité unique. De même, les fondateurs qui s'exposent à un large public financier révèlent leurs propositions de valeur à leurs concurrents, ce qui contribue à valider leur modèle d'affaires et à améliorer leur avantage concurrentiel. Les fondateurs qui passent du temps à cultiver leurs capacités et leur technologie à l'extérieur de la région profiteront d'un précieux avantage, celui de valider leur proposition de valeur et leur modèle d'affaires face à leurs concurrents distants, ce qui constitue l'obstacle ultime à surmonter. Les co-fondateurs qui approchent des investisseurs à l'extérieur de la région profiteront a) d'un élargissement de leurs connaissances sur les spécialités financières (AgTech, écotéchnologie, Pet Tech, financiers spécialistes des TIC, etc.), b) d'une exposition à leur concurrence et c) contribueront à placer la région sur la carte mondiale de l'entrepreneuriat et de l'innovation.

9. AMÉLIORATION DE L'ÉTABLISSEMENT DE RELATIONS ENTRE PAIRS

L'analyse d'une sous-section de données a révélé qu'il y avait moins de contacts entre pairs (entre fondateurs). La majorité des contacts visait plutôt à recueillir des renseignements auprès d'organisations de soutien, de gouvernements ou d'organismes de financement, par exemple. On pourrait interpréter à tort qu'il s'agit de mentorat. Toutefois, la principale différence entre les

relations entre pairs et les relations entre pair et mentor est l'âge et l'expertise du mentor. Dans les relations entre pairs, les pairs ont presque le même âge (généralement plus jeunes et à un stade précoce de développement) et présentent moins d'écarts sur le plan du stade de développement. Les fondateurs performants apprennent les uns des autres en communiquant avec d'autres fondateurs, en interagissant avec eux et en les appuyant. Il s'agit de la collision qui a lieu dans les incubateurs et les accélérateurs.

Les mentors sont généralement plus âgés et se situent à un stade plus avancé de leur carrière qu'un simple pair. Les mentors en entrepreneuriat performants peuvent devenir des tuteurs pour les entrepreneurs s'ils possèdent une crédibilité et une influence sociale uniques découlant du fait qu'ils soient des entrepreneurs de haut statut. Leur capacité à présenter leur protégé à des financiers, à des cadres titulaires de ressources, à des employés potentiels ou à des cofondateurs augmente le prestige social du protégé par association. Un mentor performant aura davantage de poids quand il recommandera son protégé à des intermédiaires (comme des sociétés de capital risque), puisqu'une recommandation provenant d'un entrepreneur au rendement élevé aura plus de valeur (auprès d'un investisseur) que celle d'une autre personne. Les mentors performants font souvent une présélection de leurs protégés potentiels pour s'assurer de travailler avec des talents d'exception auxquels il vaut la peine de consacrer du temps.

10. PRATIQUES EXEMPLAIRES À ADOPTER POUR RÉALISER UNE RECHERCHE DE MÊME NATURE

Le sondage a été distribué à différentes reprises au fil du temps et les auteurs ont reconnu qu'il était plus direct et approprié d'avoir recours aux centres d'entrepreneuriat ou de développement des entreprises pour trouver des répondants. Les centres d'entrepreneuriat et de développement des entreprises entretiennent d'étroites relations de travail avec leurs clients. Dans certains cas, il en a résulté des bases de données comptant des milliers de clients du domaine de l'entrepreneuriat avec lesquels ils ont travaillé au fil des ans et entretiennent encore des liens. Ces relations étaient plus productives pour l'administrateur local du sondage. Si le présent travail est reproduit à l'avenir, des relations de recherche doivent être cultivées avec les centres d'entrepreneuriat des universités de la région (p. ex. Institut McCain, Entrepreneurship Centre de l'Université Saint Mary's, Centre Genesis) pour distribuer les sondages.

Table des matières

SOMMAIRE.....	2
CONTEXTE.....	9
Genèse de la recherche	10
MÉTHODOLOGIE	12
Mesures fondées sur le rôle de la quête d'information dans un écosystème.....	13
Sélection de l'échantillon	13
Collecte et codage des données	16
Descriptifs du sondage	16
ANALYSE	19
Taille et centralité des nœuds	19
Écosystème entrepreneurial de l'Atlantique	20
Nouveau-Brunswick.....	21
Terre-Neuve-et-Labrador	30
Île-du-Prince-Édouard.....	34
Nouvelle-Écosse	38
Île du Cap-Breton	42
CONCLUSIONS ET RÉSULTATS	46
1. Complexité des activités de quête d'information.....	46
2. La force du nombre.....	48
3. L'information commerciale, financière et sur les marchés domine les activités de quête d'information	49
4. Trop centré sur l'Atlantique	49
5. Aspiration à la reconnaissance mondiale – Établir une distance numérique	54
6. Adopter un comportement de quête d'information qui intègre les liens faibles	55
7. Participation des entreprises matures : ne coûte rien aux entreprises matures mais n'a pas de prix pour les entrepreneurs	56
8. Recherche de capital risque à l'extérieur de la région de l'Atlantique.....	59
9. Améliorer l'établissement de relations entre pairs (et avec des mentors).....	62
10. Pratiques exemplaires à adopter pour réaliser une recherche de même nature	63
QUESTIONS SOULEVÉES PAR LA DE RECHERCHE	66
ACTIVITÉS DE MARKETING ET DIFFUSION	70
SURVEY	74
CRÉATION DE SAVOIR (MÉMOIRES DE RECHERCHE ET RAPPORTS)	
LECTURES	

CONTEXTE

Figure 1 – Comment la curiosité augmente les chances de réussite des entrepreneurs	9
Figure 2 – Activités de quête d’information dans l’EEA	20
Figure 3 – Réseau du Nouveau-Brunswick.....	24
Figure 4 – Université de Moncton	28
Figure 5 – Terre-Neuve-et-Labrador (données des campus de St. John’s et de Corner Brook de l’Université Memorial).....	32
Figure 7 – Île-du-Prince-Édouard (UPEI)	36
Figure 8 – Nouvelle-Écosse (SMU)	40
Figure 6 – Données du Cap-Breton (CBU).....	44
Figure 9 – Sous-groupe de données – Emplacement géographique des nœuds (personnes)	50
Figure 10 – Sous-groupe de données – Emplacement géographique des nœuds (organisations).....	51
Figure 11 – Participation des entreprises matures à l’écosystème entrepreneurial	58
Tableau 1 – Exemple de codage selon la théorie des réseaux	16
Tableau 2 – Répondants au sondage par emplacement de collecte de données	17
Tableau 3 – Genre et âge des répondants par emplacement de collecte de données	17
Tableau 4 – Déclaration de la profession et du statut d’Autochtone (plus d’une réponse possible).....	18
Tableau 5 – Scolarité par emplacement.....	18
Tableau 6 – Centralité de l’EEA.....	22
Tableau 7 – Principaux nœuds à Fredericton (classés par degré).....	26
Tableau 8 – Nœuds centraux (classés par degré)	27
Tableau 9 – Centralité à Terre-Neuve-et-Labrador (classés par degré)	31
Tableau 10 – Île-du-Prince-Édouard	35
Tableau 11 – Nouvelle-Écosse (données de SMU).....	39
Tableau 12 – Cap-Breton (CBU)	43
Tableau 13 – Statistiques sur le réseau de l’écosystème entrepreneurial de l’Atlantique par emplacement de collecte de données.....	46
Tableau 14 – Rendement de l’écosystème après élimination de certains groupes	48
Tableau 15 – Interventions éventuelles des entreprises matures pour appuyer les entreprises en démarrage et les fondateurs	61
Tableau 16 – Activités de marketing et diffusion (mobilisation du savoir) entre 2015 et 2018.....	66

Les relations sont importantes. Elles sont importantes, parce que l’innovation n’arrive pas seule et les possibilités entrepreneuriales ne sortent pas de nulle part. Les relations sont importantes pour l’innovation et pour produire des résultats sur le plan entrepreneurial lorsque les entrepreneurs cherchent des possibilités, ainsi que pour améliorer le rendement des entreprises.

Pour que des entreprises durables et performantes voient le jour, entreprises qui prospéreront et créeront de nombreux emplois à long terme, il faut qu’il y ait de l’innovation. Le présent travail vise à évaluer le principal moteur de l’innovation, soit la quête du savoir, ou la curiosité. De plus, il place le principal moteur de la quête du savoir, la curiosité, parmi les différents acteurs et les personnes avec lesquelles chaque acteur établit des contacts. Ces relations forment ce qu’on appelle un écosystème.

Les entrepreneurs se servent de leurs relations pour obtenir de l’information. Le savoir que cherchent les innovateurs et les entrepreneurs fait l’objet d’un suivi et est échangé entre les acteurs économiques par l’entremise de réseaux sociaux définis. En effet, de nombreuses entreprises en démarrage commencent leurs activités tout juste avec le réseau social de leur fondateur. Les entrepreneurs les plus ingénieux compensent ce manque de ressources financières ou d’atouts sur le marché ou dans l’industrie en comptant sur leur réseau familial, social et professionnel. Ces réseaux leur permettent d’accéder à de l’information et à des ressources sans avoir à prendre d’engagement ou à payer en retour. Grâce aux capacités de leur entourage et des personnes qu’ils prennent la peine de rencontrer, les entrepreneurs analysent des renseignements, génèrent des idées, obtiennent de la rétroaction et sollicitent des ressources.

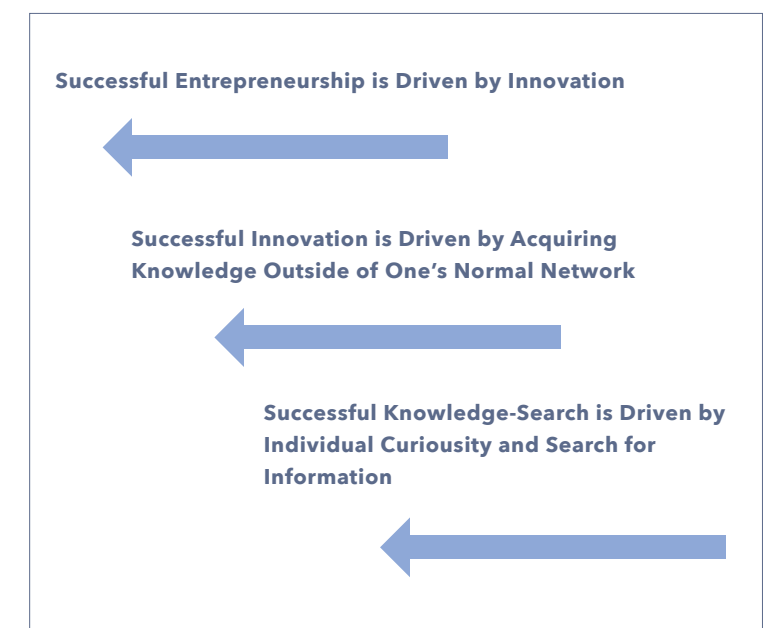
Aux endroits où il y a beaucoup d’entrepreneurs, la notion d’écosystème entrepreneurial désigne le réseau de liens et de systèmes de soutien qui permet aux entrepreneurs d’entrer en contact avec des services financiers, professionnels et technologiques et avec d’autres entrepreneurs, et d’obtenir des renseignements et du soutien. Dérivés du concept des pôles de compétitivité et des pôles d’innovation, les écosystèmes entrepreneuriaux s’entendent des relations de savoir établies entre différents éléments d’un environnement où se trouvent de nombreuses jeunes entreprises et où les activités d’innovation

éclosent et s’épanouissent.

Dans un écosystème, ceux qui sont bien établis et qui jouissent d’un vaste réseau ont accès à des résultats supérieurs en matière d’innovation en raison de la facilitation et de la circulation du savoir entre chacun. En se joignant délibérément à différents groupes de relations, les personnes qui ont de nombreux contacts bénéficient d’avantages sur le plan de l’information. Les innovateurs génèrent des idées de qualité supérieure en discutant avec d’autres, combinent leurs idées pour créer de nouveaux modèles d’affaires, découvrent de nouveaux clients et contribuent à l’épanouissement des concepts de correspondance produit-marché.

L’importance des écosystèmes entrepreneuriaux est de plus en plus accréditée, ces réseaux axés sur les résultats étant maintenant reconnus comme des accélérateurs de possibilités de développement économique, ce qui confère un avantage régional. Cultiver les services universitaires, gouvernementaux et professionnels, l’incubation, les finances et la culture au sein de l’écosystème permet de susciter des possibilités entrepreneuriales, qui constituent de puissants agents économiques positifs.

Figure 1 - How Curiosity Drives Successful Entrepreneurship



Genèse de la recherche

Les gouvernements qui souhaitent accélérer les résultats économiques qui découlent des réseaux du savoir des entrepreneurs et des écosystèmes entrepreneuriaux se sont donné comme objectif stratégique de comprendre ces éléments. En 2014, le projet sur l'écosystème entrepreneurial de l'Atlantique a entrepris l'examen des comportements de quête d'innovation des éléments entrepreneuriaux de la côte est du Canada en examinant qui s'adressait à qui et pour obtenir quel type d'information. L'enquête sur l'acquisition de savoir des entrepreneurs et des autres éléments de l'écosystème de la région a permis de faire des constatations importantes et a propulsé le projet de recherche sur la scène internationale.

La genèse de la relation avec la Mesure de recherche stratégique-Atlantique (MRSA) a commencé par une activité de sensibilisation tenue par cette dernière, à laquelle a participé Ellen Farrell, qui est maintenant chercheuse principale du projet sur l'écosystème entrepreneurial de l'Atlantique. Elle a aussi été favorisée par la participation de l'APECA à une grande conférence parrainée par l'Université Saint Mary's au cours de laquelle les travaux de Mme Farrell ont été présentés. Y ont participé des universitaires de renommée internationale (David Audretsch et Benson Honig), des organisations politiques (APECA et Industrie Canada), des organismes notoires du domaine de l'entrepreneuriat et de l'enseignement, comme la Fondation Kauffmann (Dane Stangler), et des chefs de file reconnus de l'industrie (Gerry Pond).

L'élargissement de la portée des travaux d'origine, en commençant par la Nouvelle-Écosse et Industrie Canada, a été proposé à la MRSA. Cette proposition suggérait de recueillir des données pour le projet sur l'écosystème entrepreneurial de l'Atlantique en ayant recours à des universitaires de tout le Canada atlantique afin d'augmenter la portée de l'échantillon et la participation éventuelle des répondants. La proposition acceptée prévoyait ce qui suit :

- les données générées seraient accessibles à tous les universitaires ayant participé à la recherche;
- la chercheuse principale formerait une équipe pour créer des cartes des réseaux à partir des données;
- les cartes permettraient aux universitaires et à leur communauté d'interpréter les résultats visuellement;
- l'équipe de la chercheuse principale enseignerait la théorie des réseaux aux universitaires participants et à des étudiants de premier cycle et de cycle supérieur;
- on aiderait ainsi les universitaires à communiquer leurs

- résultats à leur communauté respective et à confirmer leur importance dans les écosystèmes entrepreneuriaux;
- la participation à la rédaction des articles sur leurs constatations serait encouragée;
- le savoir mobilisé pour les travaux de recherche et le Canada atlantique serait diffusé à l'échelle mondiale.

Participants au projet

Les universitaires qui ont participé à la recherche proviennent de six universités et de sept campus. Parmi les étudiants qui ont participé à la recherche, certains étaient au premier cycle et d'autres étaient au cycle supérieur. Trois spécialistes en conception, en visualisation de réseaux et en traçage ont aussi joué un rôle clé dans la réussite du projet. Ils sont nommés dans la liste ci-dessous.

Ellen Farrell, Ph. D., chercheuse principale
Professeure, Sobey School of Business
Université Saint Mary's
Halifax, Nouvelle-Écosse

Nathan Dennison, MBA, MA
Spécialiste du secteur de la TIC, Nova Scotia Business Inc.
Halifax, Nouvelle-Écosse

Dannie Brown, DBA
Professeur, Université Cape Breton
Sydney, Nouvelle-Écosse

Izold Guihur, Ph. D.
Professeure, Département de gestion, Université de Moncton
Moncton, Nouveau-Brunswick

Stephanie Gilbert, Ph. D.
Professeure adjointe, Université Cape Breton
Sydney, Nouvelle-Écosse

Susan Graham, BBA, MBA, MPA, Ed.D.
Professeure adjointe, Université de l'Île-du-Prince-Édouard
Charlottetown, Île-du-Prince-Édouard

Basu Sharma, Ph. D.
Professeur d'études des structures, Université du Nouveau-Brunswick
Fredericton, Nouveau-Brunswick

Kevin McKague, Ph. D.
Professeur adjoint, stratégie/entrepreneuriat, Université Cape Breton
Sydney, Nouvelle-Écosse

Nancy Mathis, Ph. D.
Directrice générale, Institut Wallace McCain
Fredericton, Nouveau-Brunswick

Ken Carter, M.Ph.
Directeur, Grenfell Office of Engagement, Université Memorial
Corner Brook, Terre-Neuve-et-Labrador

Blair Winsor
Professeur adjoint, entrepreneuriat, Université Memorial
St. John's, Terre-Neuve-et-Labrador

Greg Baker
Technicien en instruments de recherche
Université Saint Mary's
Halifax, Nouvelle-Écosse

Andrea MacDonald
Propriétaire et designer, Lupin Design Studio
Halifax, Nouvelle-Écosse

Étudiants-chercheurs

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

Certaines actions menées par les entrepreneurs visent à favoriser l'innovation, mais les possibilités saisies par les entrepreneurs ne sont pas toutes novatrices. Beaucoup d'entrepreneurs créent des entreprises « suiveuses » ou de type « lifestyle », qui ne sont pas particulièrement novatrices. La quête d'information novatrice est un élément clé du bon fonctionnement des écosystèmes entrepreneuriaux, puisque l'innovation crée un courant sous-jacent d'entrepreneuriat dynamique et performant, des entreprises durables et viables qui produisent une valeur économique sur laquelle les entreprises « suiveuses » ou de type « lifestyle » peuvent s'appuyer.

La présente étude avait pour objet d'enquêter sur la curiosité des gens qui s'identifient comme un élément d'un écosystème entrepreneurial défini de façon non officielle. Le travail examinait les comportements de quête d'information des entrepreneurs et leur volonté à approcher d'autres personnes pour recueillir de l'information qui leur serait utile pour faire progresser leurs intérêts commerciaux. Des fondateurs et entrepreneurs ont été sollicités pour dresser un tableau complet des actions qu'ils mènent pour trouver de l'information novatrice à l'appui de leurs activités entrepreneuriales.

Le présent projet enquête sur les écosystèmes entrepreneuriaux de façon plus structurée et quantitative que les initiatives précédentes en matière de recherche sur les écosystèmes. Il a recours à des données de sondage et à la théorie des réseaux. Il importe de noter que le projet répond à des demandes récentes de tenir compte davantage du contexte des écosystèmes entrepreneuriaux et d'éviter d'axer l'étude sur l'entreprise ou l'entrepreneur [voir 1]. On a donc visé principalement à brosser un tableau des participants et à schématiser leur curiosité dans l'ensemble de l'écosystème du Canada atlantique. Ces deux caractéristiques font en sorte que ce travail se distingue fortement des autres méthodologies d'étude des écosystèmes entrepreneuriaux.

Dans la littérature sur la quête de possibilités, la mesure centrale utilisée pour relever l'exploitation des possibilités était « les actions menées par les entrepreneurs pour créer des possibilités et les exploiter » [2, p. 126]. La présente recherche enquête sur les actions menées par les acteurs, sur leurs méthodes officielles et non officielles pour s'unir [3] et pour créer des liens avec d'autres personnes qui pourraient avoir des réponses.

Ce travail analyse ceux qui posent des gestes notables pour trouver des possibilités, pour innover et pour développer leur entreprise. On a suivi le raisonnement selon lequel a) décrocher le téléphone, b) envoyer un courriel ou c) faire un effort délibéré pour rencontrer une personne ou pour discuter de ses affaires sont des gestes que les entrepreneurs posent pour créer des possibilités d'innovation et les exploiter. Les comportements entrepreneuriaux influencent l'innovation [1]. Les mesures que prennent les entrepreneurs pour obtenir de l'information – pour satisfaire leur curiosité en entrant en contact avec une autre personne, et non en surfant sur Internet – sont donc devenues des indicateurs d'innovation entrepreneuriale.

La méthodologie de la recherche consistait à utiliser des sondages papier, sur PDF ou sur site Web pour sonder des entrepreneurs déclarés sur les gestes fondés sur la curiosité qu'ils ont posés dans un passé distant. Nous avons aussi posé aux répondants des questions sur l'importance de l'information obtenue auprès des personnes sollicitées et sur la fréquence à laquelle pareille information a été obtenue. Le protocole du sondage était supervisé par des universitaires de six universités; nous avons ainsi pu tirer profit de leurs connaissances locales et du fait que leur nom est reconnu dans la communauté. Les sondages remis étaient automatisés et les données s'inscrivaient automatiquement dans une base de données préparée, mais quelques personnes ont fourni des résultats manuscrits.

Gephi, un logiciel libre d'analyse de réseaux, a été utilisé pour schématiser les relations des répondants – ce que nous appelons l'écosystème. Certaines personnes et organisations nommées par plusieurs répondants ou par un grand nombre d'entre eux sont devenues plus visibles lors du processus de schématisation. Les graphes qui suivent présentent différents ensembles de données et constituent un modèle qui illustre très bien l'écosystème entrepreneurial de l'Atlantique. La section suivante donne des renseignements sur la méthodologie, plus particulièrement sur les mesures, la population, la sélection de l'échantillon, la collecte de données et les descriptifs du sondage.

MESURES FONDÉES SUR LE RÔLE DE LA QUÊTE D'INFORMATION DANS UN ÉCOSYSTÈME

Dans cette étude, les comportements de quête de savoir s'entendaient d'actions menées au téléphone, en personne ou par courriel ou message texte par un élément de l'écosystème dans le but d'entrer en contact avec une autre personne en vue de trouver de l'information pour prendre une décision touchant une entreprise innovante. La source de l'information obtenue était identifiée par son nom et par son organisation.

Le type d'information était mesuré selon trois aspects : la nature scientifique ou commerciale de l'information, son importance pour l'entrepreneur et la fréquence à laquelle l'informateur a été sollicité. Les types d'information étaient évalués selon deux caractéristiques : information commerciale ou information technique. L'information commerciale englobait l'information commerciale et financière et l'information sur les marchés, tandis que l'information technique regroupait l'information technique et scientifique et l'information sur les produits. Le nombre de fois où un membre de l'écosystème a communiqué avec une autre personne et l'importance de l'information pour la personne l'ayant demandée étaient mesurés à l'aide d'une échelle de Likert à sept points. Veuillez consulter le sondage à la section Sondage.

SÉLECTION DE L'ÉCHANTILLON

Il n'existe pas de liste de tous les entrepreneurs ou de toutes les entreprises innovantes parce qu'il n'existe pas de définition arbitraire du terme « entrepreneur ». La définition du terme « entrepreneuriat » varie d'une étude à l'autre et son opérationnalisation méthodologique varie tout autant.

1. Par exemple, selon une bonne source, les entreprises innovantes sont toutes celles qui ne sont pas encore cotées en bourse. Wow! C'est très vague, il s'agit de toutes les entreprises privées du monde.
2. Une autre définition accepte les entreprises qui innoveraient (ce qui fait d'elles des entreprises innovantes même si elles ne sont pas petites, nouvelles ou récemment fondées). Toutefois, pour savoir si une entreprise innove, il faudrait poser beaucoup, beaucoup de questions avant même d'aborder le sujet, et la discussion pourrait aussi être difficile à lancer.
3. La croissance rapide de l'entreprise est aussi une caractéristique qui revient souvent. Évidemment, cela engloberait certaines des plus grandes entreprises dans le monde actuellement. Pour dire d'une entreprise qu'elle croît rapidement, il faudrait poser un grand nombre de questions, et savoir quel genre de réponse nous souhaitons obtenir. La croissance serait-elle financière, ou serait-il suffisant

d'avoir une croissance du nombre d'employés? Est-ce que ce sont les recettes ou le profit qui croissent rapidement? Que signifie « rapide »? Qu'en est-il d'une entreprise qui a reçu beaucoup de capital de risque et qui embauche, mais qui ne génère aucune recette? Considérera-t-on qu'elle croît rapidement? Il n'est donc pas surprenant qu'il soit difficile de trouver une définition.

4. Les licornes sont un sujet qui prend de l'ampleur sur Twitter, sur les blogues et sur LISTSERV.
5. Beaucoup d'entreprises ne sont pas jeunes ou ne sont plus en démarrage lorsqu'elles atteignent leur vitesse de croisière. Elles peuvent donc être ignorées lors de la création des échantillons.
6. Une autre méthode reconnue pour opérationnaliser un échantillon consiste à utiliser les personnes qui détiennent ou gèrent actuellement une jeune entreprise [4]. Si on échantillonne les jeunes entreprises, on ne répond toutefois pas au critère général selon lequel une entreprise innovante est une entreprise qui innove ou qui croît rapidement. En passant, après combien d'années une entreprise cesse-t-elle d'être jeune?
7. Certains pourraient se contenter de sonder des entrepreneurs en technologie plutôt que des entrepreneurs traditionnels. (La définition de ces deux groupes diffère de ce que la plupart des gens pourraient penser. Les caractéristiques qui définissent les entrepreneurs en technologie sont abordées dans la section Questions soulevées par la recherche. Les entrepreneurs traditionnels qui performant génèrent des recettes, créent des emplois et paient de l'impôt. Les entrepreneurs en technologie sont définis en fonction de la vente de leurs innovations, sans égard aux recettes, au nombre d'employés et au profit découlant des gains en capital.) Même si ces caractéristiques étaient souhaitables au sein de l'échantillon, le fait que la technologie informatique soit intégrée à tous les secteurs brouille la frontière entre les soi-disant entrepreneurs en technologie et les entrepreneurs traditionnels.

En réalité, si on essaie de définir l'échantillon avec des caractéristiques précises et rigides, on risque d'omettre une grande partie du tableau, surtout dans un écosystème entrepreneurial, et en particulier dans un cas où la zone couverte est vaste et la population est petite. Décrivons-nous un écosystème ou examinons-nous une population précise? Néanmoins, la recherche effectuée ici est fondée sur la quête d'innovation; les résultats dépendent donc entièrement de la mesure dans laquelle l'entrepreneur est axé sur l'innovation et la croissance rapide. La détermination des échantillons pointait fortement dans cette direction (fouiller auprès d'Entrevestor, des

fortement dans cette direction (fouiller auprès d'Entrevestor, des centres d'entrepreneuriat, des fichiers rotatifs de faculté, etc.).

La recherche a été effectuée selon une approche constructiviste et la méthode d'échantillonnage décrit et explique ce qu'est un entrepreneur tout en permettant aux entrepreneurs de s'identifier eux-mêmes. Elle tient compte des perceptions qu'ont les répondants d'eux-mêmes en tant qu'entrepreneurs, sans égard au moment de la fondation, au type d'entreprise, au statut du fondateur, aux recettes, au taux de croissance, au nombre d'employés ou au financement obtenu. Pour les travaux émergents de recherche quantitative comme celui-ci, cela permet d'interpréter les données et d'étudier le contexte et le cadre des éléments de l'écosystème plutôt que de les prescrire. Puisque la recherche sur les écosystèmes est récente dans la littérature, il faut une étude plus constructive pour commencer à comprendre les acteurs, le contexte, leurs relations et leur rôle dans l'écosystème.

De plus, en examinant l'entrepreneuriat au sens large, il est possible d'effectuer différents types d'analyse en comparant les actions de quête du savoir de différentes cohortes. Par exemple, on compare la quête du savoir d'entreprises en démarrage à celle d'entreprises qui sont innovantes sans être nouvelles, la quête du savoir d'entreprises en démarrage dans le domaine des technologies dont le fondateur est plus âgé à celle d'entreprises dont le fondateur est très jeune, ou encore on analyse les écarts entre les entreprises en démarrage à croissance rapide et les entrepreneurs plutôt de type « lifestyle ».

Les échantillons ont été constitués dans chacune des régions des universitaires et de leurs ressources, soit Halifax, Sydney, Charlottetown, Corner Brook, St. John's, Moncton et Fredericton. Lors de la création d'échantillons, bon nombre d'études bien connues ont eu recours à une variété de méthodes complémentaires qui permettent de ratisser large. Nous avons adopté un assemblage de ces approches pour constituer des échantillons des personnes qui détiennent ou gèrent actuellement une entreprise innovante à partir de différentes sources, dont les suivantes :

- Collecte des contacts des chercheurs principaux (p. ex. Parker et van Praag, 2006; Lee et Marvel, 2014);
- Autorités de développement régional (p. ex. Conseil économique du Nouveau-Brunswick) (p. ex. Ayala et Manzano, 2014);
- Autorités de développement rural (Rural and Regional Développement PEI) (p. ex. Stefan, 2014);
- Noms d'entreprises trouvés dans des médias comme Entrevestor.com (un service de nouvelles sur

l'entrepreneuriat), AllNovaScotia.com et AllNewfoundland.com (services de nouvelles sur les affaires);

- Sites de réseautage en ligne comme LinkedIn;
- Collègues d'université et de fonds de capital de risque;
- Organisations gouvernementales et axées sur l'incubation, comme Planet Hatch, Genesis Centre et Volta;
- Groupes de soutien en ligne des entrepreneurs locaux sur Facebook (Corner Brook);
- Échantillonnage axé sur le répondant (Biernacki, 1981);
- Blitz d'entrepreneuriat en collaboration avec l'APECA et l'Université Cape Breton afin de rencontrer des entrepreneurs et de parler de la distribution imminente du sondage (Cap-Breton).

Fait saillant sur le marketing et la distribution

L'Université Cape Breton, en collaboration avec des représentants locaux de l'APECA, a tenu un blitz de données pour susciter un engouement à l'égard du projet et de la participation de l'Université. Les médias ont fait la promotion de l'activité, et des universitaires, des organisations de soutien et des étudiants ont joué un rôle important dans la communauté en aidant les entrepreneurs à remplir leur sondage.

COLLECTE ET CODAGE DES DONNÉES

La plupart des sondages ont été transmis aux répondants à partir de l'adresse électronique du chercheur principal de la région. On a décidé de distribuer les sondages par courriel pour éviter les services de collecte de données et pour tirer parti de la réputation du chercheur. Les services comme Survey Monkey ont été évités pour veiller à ce que le processus d'exportation des données depuis les sondages soit effectué sur des serveurs appartenant aux différentes universités locales et exploités par celles-ci plutôt que par un tiers indépendant. En veillant à ce que seules les universités (principalement l'Université Saint Mary's) détiennent les données, nous avons pu garantir la confidentialité de tous les renseignements personnels recueillis. 2. La distribution par courriel permet de profiter de la réputation du chercheur de la région et donne de la crédibilité aux demandes. Lorsqu'on n'utilisait pas l'adresse électronique d'un universitaire, les réponses se faisaient moins nombreuses.

Le protocole de sondage a été exécuté à l'aide d'un sondage sous forme de formulaire à remplir, ou d'un sondage en ligne plus tard dans la phase de collecte de données, pour permettre aux répondants de remplir le sondage sur un appareil mobile s'ils le souhaitent. Les données ont été obtenues dans des formulaires PDF à remplir ou sur un lien vers un site Web, et ont été exportées dans des fichiers .csv. Le processus était automatisé afin que l'information fournie avec l'une ou l'autre de ces méthodes remplisse automatiquement la base de données. Le nettoyage et le codage des données étaient primordiaux pour veiller à ce qu'une organisation ne soit pas représentée par plusieurs nœuds. Par exemple, Genesis Centre, Genesis Center, Genesis MUN et GC at Memorial apparaîtraient sous quatre nœuds distincts si un observateur ne les codait pas tous sous le même nœud.

Une analyse a été effectuée à l'aide de Gephi, un logiciel d'analyse de réseaux complexes [5]. Le tableau 1 ci-dessous montre la façon dont ces données ont été codées. Par exemple, Jane Smith a répondu au sondage et est codée comme Agent 1. Elle a déclaré entretenir des liens avec trois personnes qui sont codées Agent 2, 3 et 4. La pondération, la fréquence et le type d'information demandée sont sondés et sont aussi codés. Ensuite, si John Doe (Agent 43) mentionne Jane Smith, elle est déjà codée en tant qu'Agent 1.

Tableau 1 - Exemple de codage selon la théorie des réseaux

Source	Cible	Pondération (1 à 7)	Fréquence (n ^{bre} /année)	Type d'information
Agent 1	Agent 2	6	30	Commerciale/financière/marché
Agent 1	Agent 3	2	10	Les deux
Agent 1	Agent 4	1	1	Aucun
Agent 1	Agent 5	7	100	Produit/service/technique
Agent 43	Agent 1	6	2	Produit/service/technique

¹L'échantillonnage basé sur le répondant convient pour l'analyse de réseaux (Biernacki, 1981) lorsque les répondants indiquent les personnes auprès desquelles ils ont obtenu des conseils, de l'information ou des connaissances au sujet de projets entrepreneuriaux. Les personnes indiquées par les répondants deviennent la source pour la distribution du sondage, ce qui élargit l'échantillon et permet de trouver de nouveaux répondants éventuels. Cette méthode peut permettre d'accéder à des agents cachés qui jouent un rôle dans l'écosystème entrepreneurial. Il est aussi reconnu que certains influenceurs ne feront pas partie de l'échantillon.

DESCRIPTIFS DU SONDAGE

La présente sous-section se penche sur la répartition des répondants des différents emplacements, sur leur genre, sur leur âge et sur la profession des répondants telle qu'ils l'ont eux-mêmes déclarée. Le Tableau 2 – Répondants au sondage par emplacement de collecte de données décrit les réponses provenant des différents endroits nommés par l'université participante. Au total, il y a 553 répondants.

Tableau 2 - Répondants au sondage par emplacement de collecte de données

Emplacement de collecte de données	N ^{bre}	% du total
MUN-CB	51	9,2
MUN-SJ	105	19
CBU	72	13
UPEI	83	15
UdeM	26	4,7
UNB	137	24,8
SMU	79	14,3
Nombre total de sondages remplis	553	100

Parmi les 533 personnes qui ont répondu au sondage, 150 (28,1 %) étaient des femmes et 368 (69 %) étaient des hommes. Quinze personnes ont refusé de révéler leur genre. La majorité des répondants avaient entre 26 et 65 ans. Les répondants de 26 à 35 ans comptaient pour 24 %, ceux de 36 à 45 ans comptaient pour 26,6 % et ceux de 46 à 65 ans comptaient pour 38,5 %. Les catégories des 46 à 55 ans et des 56 à 65 ans ont été combinées par inadvertance, et il est maintenant impossible de les distinguer. Si on suppose que la catégorie des 46 à 55 ans représentait 28 % du total, la catégorie des 56 à 65 ans correspondrait aux 10,5 % restants.

Tableau 3 - Genre et âge des répondants par emplacement de collecte de données

	GENRE				ÂGE						
	Homme	Femme	Refus	Total	18-25	26-35	36-45	46-65	66+	Refus	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 (n^{bre})	368	150	15	533	21	129	142	205	17	19	533
% de répondants	69	28,1	2,8	100	3,9	24,2	26,6	38,5	3,2	3,6	100

Le tableau 4 aborde la nature du rôle des répondants au sein de l'écosystème. Les répondants pouvaient choisir plus d'une catégorie. La plupart des répondants étaient des entrepreneurs (47,9 %), des entrepreneurs sociaux (7 %) ou des consultants (11,7 %). Ensemble, les investisseurs individuels privés (5 %) et les représentants du gouvernement (5,1 %) constituaient le quatrième groupe en importance.

Tableau 4 - Déclaration de la profession et du statut d'Autochtone (plus d'une réponse possible)

	Entrepreneur	Entrepreneur social	Autochtone	Société de capital risque	Investisseurs individuel privé	Membre d'un réseau	Avocat	Comptable	Représentant du	Consultant	Journaliste	Professeur	Employé d'une entreprise	Employé d'un laboratoire de	Banquier	Autre
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
% du total	47,9	7	1,7	2,6	5	1,3	0,7	1,6	5,1	11,7	0,6	3,9	3,9	0,6	0,1	6,3

Auparavant, on tenait pour acquis que l'entrepreneuriat était un domaine pour les gens qui n'ont pas fait d'études supérieures, mais cette notion a récemment été écartée, comme le confirme le tableau 5. Près de 85 % des répondants avaient un diplôme d'études supérieures. Sur ce total, 33,3 % avaient un baccalauréat, 17,8 % avaient une maîtrise ou un diplôme professionnel, 14,7 % avaient un diplôme collégial ou d'une école de formation professionnelle, et 5,4 % avaient un doctorat.

Tableau 5 - Scolarité par emplacement

	Études secondaires ou l'équivalent (n ^{bre})	Collège (n ^{bre})	École de formation professionnelle ou technique (2 ans) (n ^{bre})	Baccalauréat (n ^{bre})	Maîtrise (n ^{bre})	Diplôme professionnel (MD, JD, etc.) (n ^{bre})	Doctorat (n ^{bre})	Autre (n ^{bre})
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 (n^{bre})	115	48	64	254	146	59	41	36
Pourcentage du total (%)	15,1	6,3	8,4	33,3	10,1	7,7	5,4	4,7

L'analyse présente et souligne les données de différents points de vue, et il s'agit là du fondement de bon nombre des constatations figurant dans la prochaine section. Les concepts de taille et de centralité des nœuds sont abordés ensuite pour aider les lecteurs à comprendre le contexte des illustrations qu'ils consulteront. Par la suite, des illustrations (graphes) de chaque emplacement de collecte de données sont présentées afin de montrer les différents acteurs de l'écosystème (nœuds) et les types de renseignements obtenus (couleur des arêtes). Le graphe de chaque emplacement de collecte de données est accompagné d'un tableau qui souligne les nœuds les plus importants, soit les organisations qui sont les plus sollicitées à chaque emplacement.

Taille et centralité des nœuds

Chaque organisation signalée par des répondants et comprenant des répondants est représentée par un nœud, un petit cercle d'une couleur correspondant au type de groupe d'éléments auquel elle appartient (université, gouvernement, entrepreneur, etc.). Au total, 1 666 nœuds ont été relevés dans l'écosystème entrepreneurial de l'Atlantique.

La taille du nœud de l'organisation correspond au nombre de fois où des participants de l'écosystème l'ont *approchée pour obtenir de l'information* ainsi qu'à la valeur de l'information donnée. Les nœuds peuvent donc être de grande taille seulement si l'organisation a été souvent mentionnée par d'autres participants de l'écosystème. La taille du nœud ne peut pas être influencée par l'organisation elle-même. Elle n'est pas influencée par le nombre de sondages que les employés de l'entreprise ont remplis. Ainsi, la taille du nœud d'une organisation n'est pas influencée par sa propre activité de quête d'information, mais plutôt par l'information qui a été obtenue auprès d'elle.

Par exemple, le nœud de Build Ventures est de bonne taille, mais seulement parce que de nombreuses organisations ont obtenu de l'information auprès de ce fonds de capital risque et ont trouvé cette information utile.

La centralité du nœud est une mesure de son interdépendance

au reste de l'écosystème. La centralité découle du fait que de nombreuses demandes d'information sont présentées à une organisation de la part de toute une gamme d'autres organisations de l'écosystème. La centralité peut aussi signifier que l'organisation a établi des contacts avec bon nombre d'autres organisations. Par exemple, une entreprise innovante comme NewPace est très centrale parce qu'elle a demandé de l'information à des dizaines d'autres organisations; elle a de nombreux contacts pour obtenir de l'information et se trouve donc en position centrale. Toutefois, son nœud est de petite taille parce qu'elle n'a pas fourni d'information à beaucoup d'autres entreprises.

Vous trouverez dans les pages suivantes un graphe pour chaque emplacement où les sondages ont été distribués. Chaque graphe illustre les différents nœuds ainsi que le pourcentage de nœuds pour chaque groupe : entreprises, sociétés de capital risque, professionnels, gouvernements, institutions financières et organisations de soutien. Chaque graphe est aussi accompagné d'une légende qui indique le pourcentage d'information demandée (arêtes). L'information demandée est classée en deux catégories : l'information commerciale, financière ou sur les marchés, qui désigne l'information que les entreprises obtiennent pour apprendre comment exploiter une entreprise ou établir de nouveaux modèles d'affaires. L'autre grande catégorie regroupe l'information technique, scientifique ou sur les produits, qui désigne l'information que les entreprises obtiennent pour apprendre comment développer des produits et innover sur le plan des produits et des capacités de l'entreprise.

Fait saillant sur le marketing et la distribution

La première fois où cette recherche a été présentée à un public, tout le monde dans la salle a retenu son souffle. Saisis par le caractère intuitif des illustrations, les participants à la Financing Knowledge Transfer Conference, parrainée par la Banque européenne d'investissement et le ministère de l'Éducation de l'Italie, ont immédiatement reconnu le potentiel de ce type de travail pour tirer des conclusions sur la quête d'information et les politiques connexes.

ÉCOSYSTÈME entrepreneurial de l'Atlantique

La section qui suit se penche sur les participants de l'écosystème qui sont représentés par des nœuds de différentes couleurs dans les graphes, et sur le type d'information qu'ils ont obtenue. Les sous-sections qui suivent abordent notamment l'EEA, puis les éléments sont décomposés par emplacement de collecte de données, dans l'ordre suivant : données du Nouveau-Brunswick provenant de l'Institut McCain de l'UNB et de l'UdeM, données de Terre-Neuve-et-Labrador provenant des campus de Corner Brook et de St. John's de l'Université Memorial, données de la Nouvelle-Écosse provenant de la CBU et de la SMU, et données de l'Île-du-Prince-Édouard provenant de l'UPEI.

Sous leur forme imprimée, les graphes donnent un aperçu de la complexité de l'écosystème, mais sont trop petits pour donner d'autres renseignements. Si vous disposez d'un exemplaire du rapport en format PDF numérique, vous pouvez agrandir les pages et voir les détails de chaque nœud et arête.

Les plus gros nœuds sont ceux qui ont donné de l'information à beaucoup d'autres organisations, information qui a été jugée utile par les répondants. Chaque graphe de réseau est accompagné d'une description et est suivi d'un tableau dans lequel les nœuds sont présentés par degré de centralité.

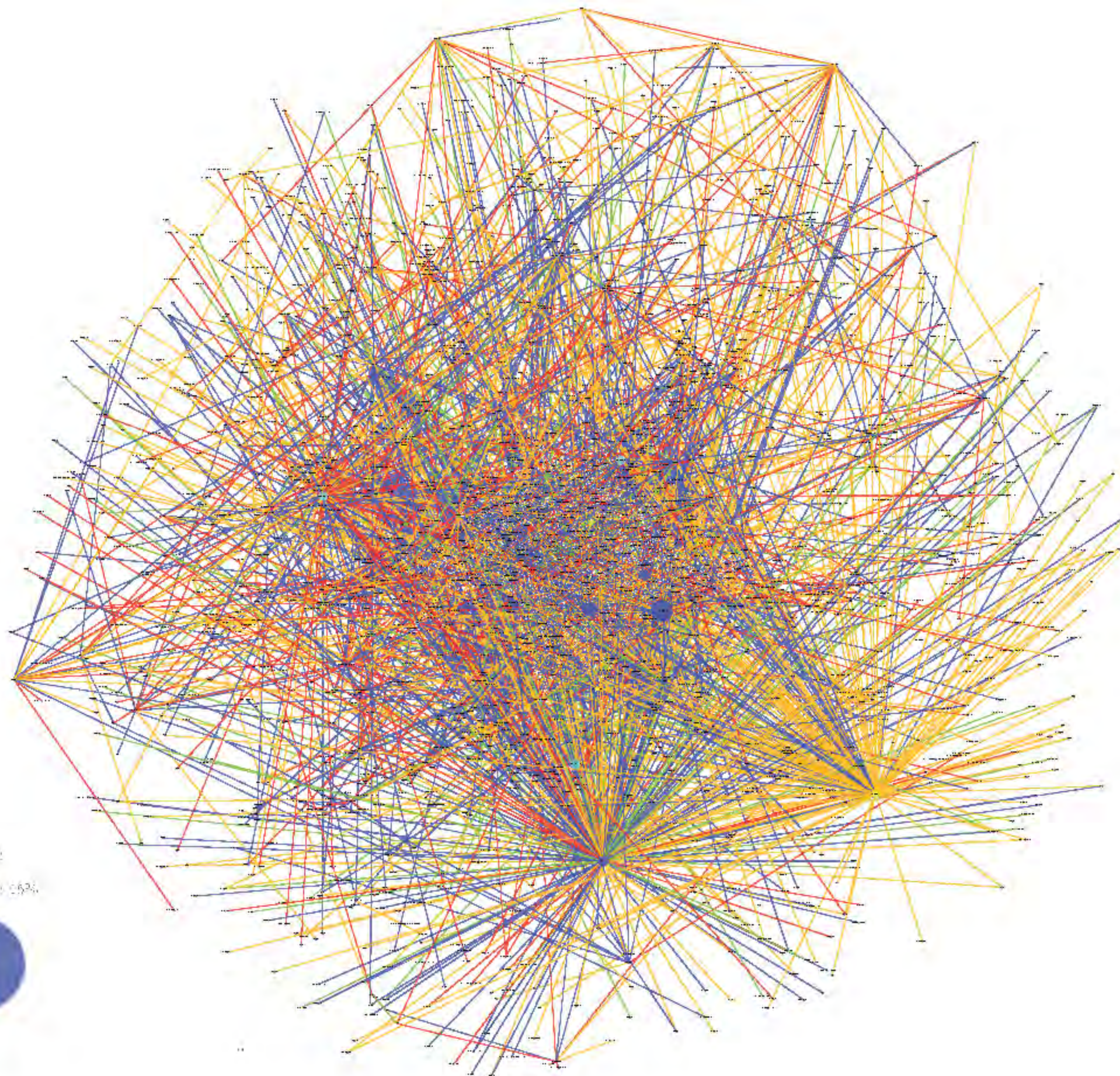


FIGURE 2 – ACTIVITÉS DE QUÊTE D'INFORMATION DANS L'EEA

1666 nodes

3397 edges

- Entrepreneurial Firm: 58%
- Support Organization: 17%
- Venture Capital/Angel Network: 6%
- Financial Institution: 2%
- University/College/Research: 3%
- Accounting/Law Firm: 8%
- Government Agency: 7%



- Product/Service/Technical: 25%
- Business/Market/Financial: 25%
- Both: 33%
- Neither: 17%



L'écosystème entrepreneurial de l'Atlantique présente 1 666 nœuds et 3 397 demandes d'information déclarées. Il semblerait sans doute utile que tous les membres de l'écosystème déclarent leurs activités, mais comme vous pouvez le constater, l'illustration gagnerait en complexité et l'information supplémentaire ajouterait bien peu de valeur.

Tableau 6 - Centralité de l'EEA (classés par degré)

Nom	Degré entrant	Degré sortant	Degré	Degré entrant pondéré	Degré sortant pondéré	Degré pondéré
Innovacorp	38	283	321	314	2 536	2 850
Build Ventures	28	180	208	215	968	1 183
APECA	122	63	185	734	416	1 150
Université Memorial	42	65	107	276	423	699
Université Saint Mary's	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
Conseil national de recherches (CNRC)	59	0	59	341	0	341
GrowthWorks Atlantic	16	35	51	129	276	405
Gouvernement de T.-N.-L. - TCII	29	17	46	160	93	253
CBDC	37	0	37	165	0	165
Propel ICT	34	2	36	150	2	152
McInnes Cooper	31	4	35	205	18	223
Grant Thornton	34	0	34	201	0	201
Cox & Palmer	23	11	34	138	70	208
TD Canada Trust	32	0	32	150	0	150
Université Dalhousie	28	0	28	280	0	280
Innovation PEI	28	0	28	164	0	164
First Angel Network	25	0	25	159	0	159
Stewart McKelvey	21	0	21	159	0	159
East Valley Ventures	21	0	21	151	0	151
Volta Labs	20	0	20	145	0	145

Nouveau-Brunswick

Nancy Mathis, Ph. D., et Basu Sharma, Ph. D., étaient les partenaires clés de l'Université du Nouveau-Brunswick, et l'excellente base de données de l'Institut McCain a été d'une aide immense en raison de son efficacité. L'échantillon pour le sondage a aussi été constitué à partir de listes de coordonnées fournies par Karen Murdock, ancienne directrice du International Business and Entrepreneurship Centre et agente de programme principale à Planet Hatch. M. Sharma la remercie grandement pour sa contribution. La vitesse à laquelle les réponses ont été reçues au moment de l'activation de la base de données de l'Institut McCain témoigne de la réputation de l'organisation. De plus, la portée de l'Institut s'étend à d'autres emplacements (ce qui est une bonne chose), et cela se reflète dans les données qui en résultent; en effet, certaines organisations de la Nouvelle-Écosse figurant sur la liste ont répondu à l'initiative de Mme Mathis.

Les données de l'Université de Moncton ont été recueillies par Izold Guihur, Ph. D., avec l'aide d'étudiants, d'organisations de développement économique et de chambres de commerce.

Les graphes ne sont pas prescrits et il ne s'agit pas non plus de représentations schématiques d'organisations en particulier. Il ne s'agit pas d'une illustration des organismes, mais plutôt de certains acteurs de l'écosystème, les répondants, et de leurs actions liées à la quête d'information. Aucune liste prédéterminée d'organismes fédéraux et provinciaux, de capitaux de risque, de banques ou de professionnels n'a été fournie aux répondants. Les nœuds (personnes et organisations) qui forment le graphe correspondent aux personnes qui ont répondu au sondage et à celles qui ont été mentionnées. Il y a souvent un chevauchement entre les deux.

Puisqu'il n'existe pas de population définie d'entrepreneurs (voir la section Sélection de l'échantillon), il est impossible de décrire avec exactitude les activités de quête d'information. Ces analyses de réseaux rassemblent des données provenant d'une vaste gamme de participants, afin de dresser un portrait de ces participants.

Dans les données du Nouveau-Brunswick, les entreprises innovantes et matures représentent 51 % des 396 nœuds. Les organisations de soutien, pour leur part, correspondent à 14 % des nœuds. Les organisations de soutien comprennent

des incubateurs et des accélérateurs comme Planet Hatch, Springboard Atlantic, Futurepreneur, Start-up Zone, Bio NB et d'autres organisations semblables, dont certaines sont privées et d'autres sont publiques. Ensemble, les fonds de capital risque et les investisseurs providentiels (3 %) et les institutions financières (4 %) représentent 7 % des nœuds. Les universités, les collèges et les organisations de recherche comptent pour 5 %. Enfin, les entreprises professionnelles et les gouvernements représentent respectivement 11 et 12 % des nœuds.

Les demandes d'information technique, scientifique ou sur les produits représentent seulement 24 % des demandes, en plus de 28 % des répondants qui ont indiqué avoir demandé de l'information dans les deux catégories. L'information commerciale, financière ou sur les marchés a dépassé l'information technique, avec un total de 74 % (46 % + 28 % = 74 %).

Sur ces graphes, la centralité représente le nombre total d'interactions différentes auxquelles chaque nœud a été exposé. Plus chaque nœud est lié à différents autres nœuds, plus il apparaîtra au centre du graphe. La centralité du nœud n'a aucun effet sur sa taille. Un très petit nœud (une personne qui a demandé beaucoup d'information, mais qui n'a pas été sollicitée) peut se trouver très au centre parce qu'il est relié à de nombreux autres nœuds. Par exemple, Smarter Spaces est un très petit nœud (situé entre la BDC et l'UNB) parce que personne ne lui a demandé d'information. Toutefois, l'entreprise est très au centre parce qu'elle est reliée à 13 autres organisations.

FIGURE 3 – RÉSEAU DU NOUVEAU-BRUNSWICK

396 nodes 504 edges

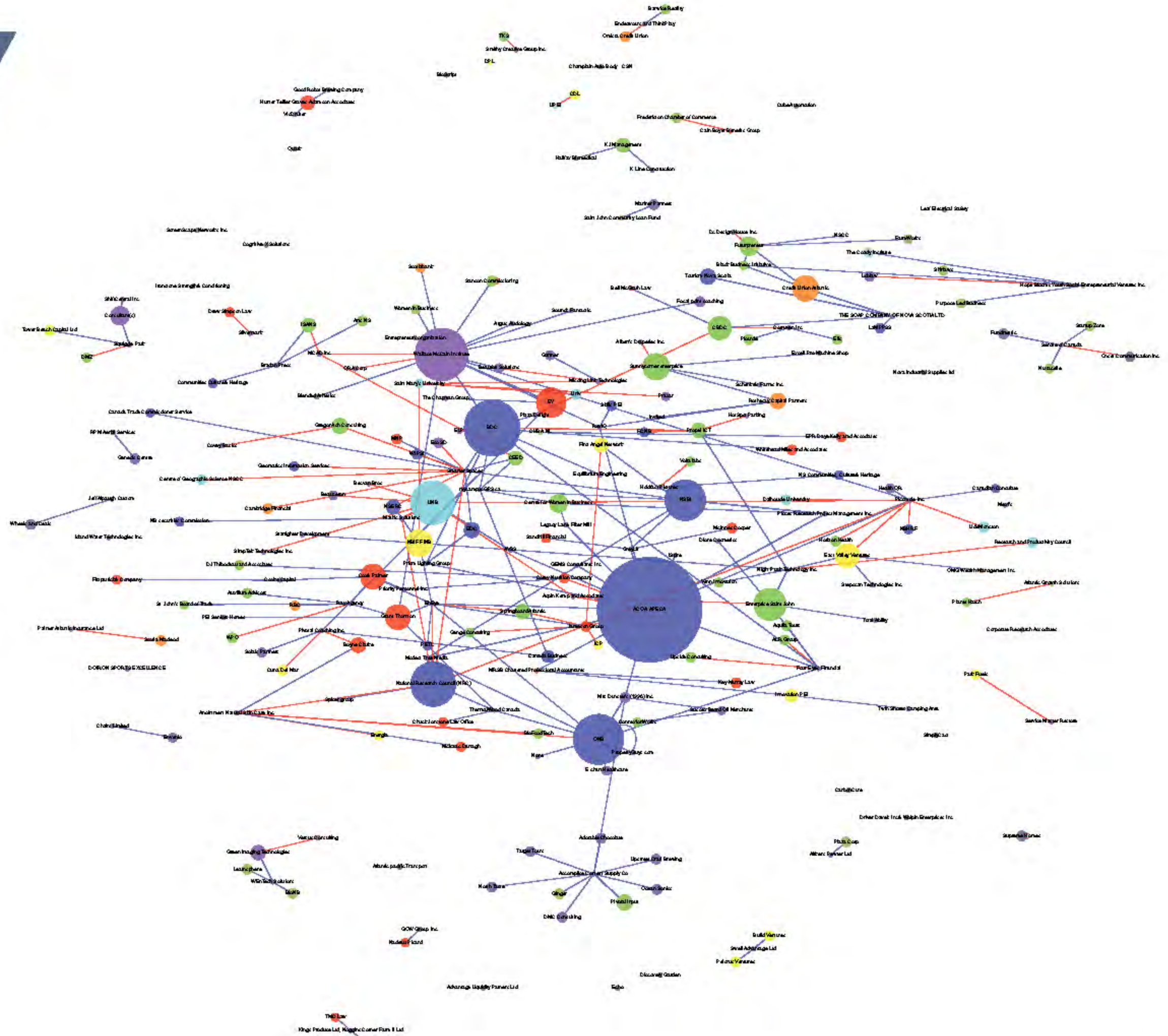
NODES

- Entrepreneurial Firm: 51%
- Support Organization: 19%
- Venture Capital/Angel Network: 3%
- Financial Institution: 1%
- University/College/Research: 5%
- Accounting/Law Firm: 11%
- Government Agency: 12%



EDGES

- Product/Service/Technical: 21%
- Business/Market/Financial: 46%
- Both: 26%
- Neither: 2%



Fait saillant sur le marketing et la distribution

Pendant que les données étaient en cours d'analyse, une activité d'engagement communautaire a eu lieu à l'Université Crandall pour présenter le travail et certaines conclusions préliminaires à des leaders d'opinion. Parmi les participants, mentionnons parmi tant d'autres des chambres de commerce, EY, des organisations de développement économique, l'Université de Moncton, Opportunités NB, la Ville de Dieppe, le dirigeant de Startup Fredericton et un député.

Tableau 7 - Centralité des nœuds au Nouveau-Brunswick (UNB) (classés par degré)

Nom	Degré entrant	Degré sortant	Degré	Degré entrant pondéré	Degré sortant pondéré	Degré pondéré
APECA	17	0	17	127	0	127
Institut Wallace McCain	10	6	16	61	45	106
ONB	9	2	11	58	12	70
BDC	10	0	10	65	0	65
Conseil national de recherches (CNRC)	8	0	8	51	0	51
UNB	6	1	7	50	6	56
NSBI	6	0	6	46	0	46
Enterprise Saint John	5	0	5	35	0	35
FINB	5	0	5	28	0	28
Grant Thornton	5	0	5	26	0	26
Futurpreneur	3	2	5	18	12	30
EY	4	0	4	32	0	32
Sunny Corner Enterprises	4	0	4	28	0	28
Cox & Palmer	4	0	4	26	0	26
East Valley Ventures	4	0	4	25	0	25
CBDC	4	0	4	24	0	24
Propel ICT	2	2	4	13	13	26
Credit Union Atlantic	3	0	3	27	0	27
Centre for Women in Business	3	0	3	17	0	17
Rothesay Capital Partners	2	1	3	14	7	21
Consultant(s)	2	0	2	18	0	18
EDC	2	0	2	14	0	14
Gregor Ash Consulting	2	0	2	14	0	14
Pivotal Input	1	0	1	14	0	14

Les résultats de l'Université de Moncton sont présentés ci-dessous. Parmi les 151 nœuds dans les graphes de l'UdeM, 34 % sont des entreprises, et la majorité sont innovantes. Beaucoup d'organisations de soutien sont représentées dans les données, pour un total de 22 % des nœuds (environ 33 organisations). Ensemble, les sociétés de capital risque et les institutions financières représentent 8 % des nœuds, tandis que la catégorie des universités représente 7 % (y compris notamment l'UQAM, le Collège McKenzie, l'UNB, l'école secondaire de Moncton et le CCNB). Comme nous l'avons vu dans les autres graphes, les services professionnels, les ministères et les organismes gouvernementaux sont bien représentés, avec 14 % et 14 % des nœuds respectivement.

L'information technique, scientifique et sur les produits dominait avec un total de 73 % (45 % + 28 % = 73 %), tandis que l'information commerciale, financière et sur les marchés tirait de l'arrière à 68 % (45 % + 23 % = 68 %).

FIGURE 4 – UNIVERSITÉ DE MONCTON

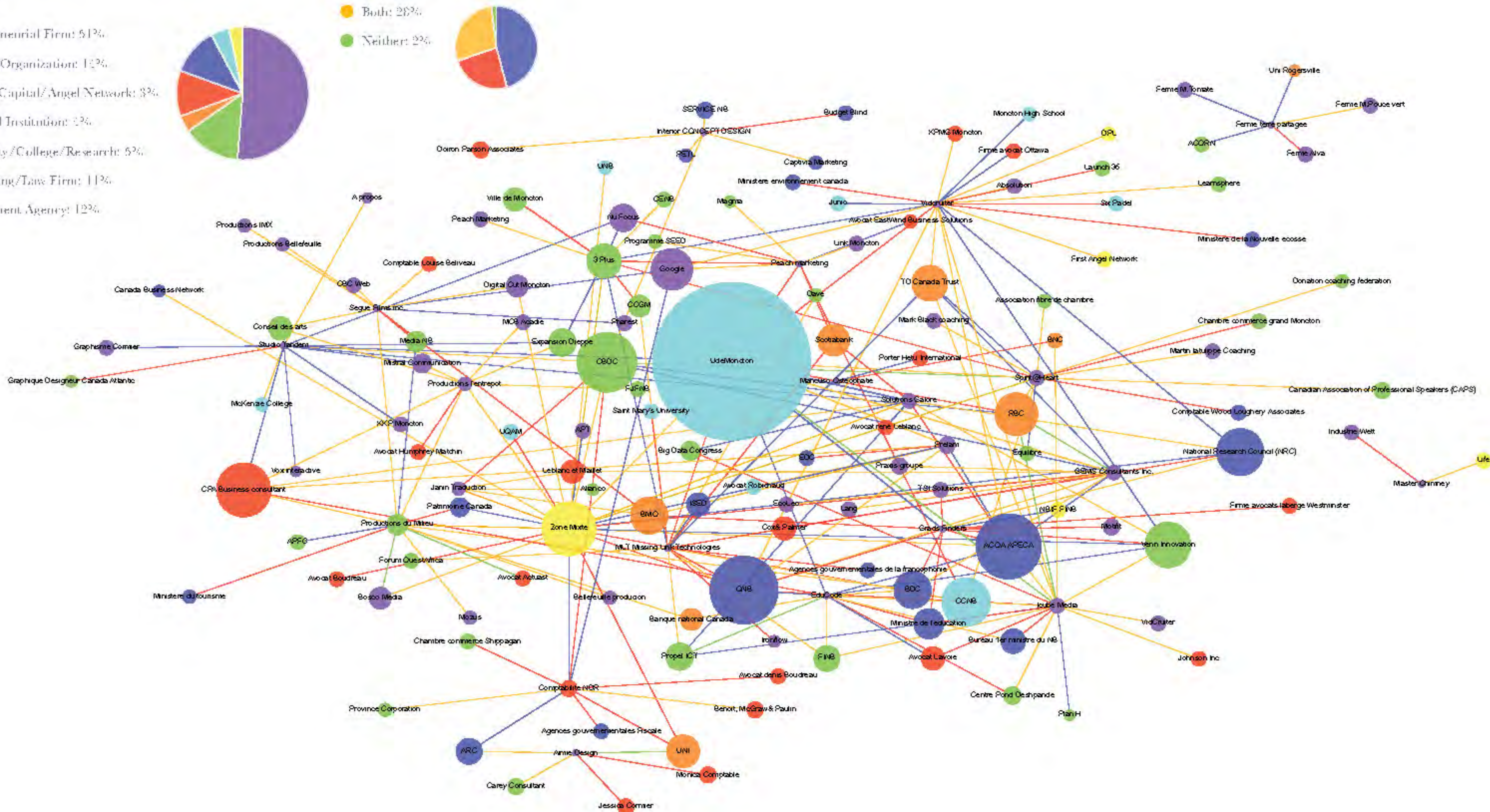
396 nodes 504 edges

NODES

- Entrepreneurial Firm: 51%
- Support Organization: 12%
- Venture Capital/Angel Network: 3%
- Financial Institution: 2%
- University/College/Research: 5%
- Accounting/Law Firm: 11%
- Government Agency: 12%

EDGES

- Product/Service/Technical: 21%
- Business/Market/Financial: 16%
- Both: 26%
- Neither: 2%



La centralité des données de l'Université de Moncton est bien répartie. Tout au centre du graphe, il y a de petits nœuds qui représentent les entreprises qui ont approché de nombreuses organisations pour appuyer leurs activités. De même, il y a quelques gros nœuds qui se situent plutôt en périphérie, ce qui indique que les principales demandes d'information qu'elles ont reçues provenaient de nœuds qui ne sont pas au centre.

Tableau 8 - Centralité des nœuds au Nouveau-Brunswick (UdeM) (classés par degré)

Nom	Degré entrant	Degré sortant	Degré	Degré entrant pondéré	Degré sortant pondéré	Degré pondéré
Zone Mixte	6	24	30	34	124	158
UdeM	13	0	13	108	0	108
3 Plus	5	7	12	20	47	67
ONB	8	0	8	44	0	44
APECA	8	0	8	42	0	42
CBDC	8	0	8	38	0	38
CPA consultant en affaires	6	0	6	34	0	34
CCNB	6	0	6	30	0	30
Venn Innovation	6	0	6	28	0	28
Conseil national de recherches (CNRC)	5	0	5	29	0	29
RBC	5	0	5	26	0	26
TD Canada Trust	5	0	5	21	0	21
Google	4	0	4	25	0	25
BMO	4	0	4	22	0	22
BDC	4	0	4	22	0	22
Propel ICT	4	0	4	15	0	15
UNI	3	0	3	19	0	19
Banque Scotia	3	0	3	18	0	18
Ministre de l'Éducation	3	0	3	17	0	17
Expansion Dieppe	3	0	3	15	0	15
Nu Focus	3	0	3	15	0	15
FINB	3	0	3	14	0	14
ARC	2	0	2	14	0	14

Terre-Neuve-et-Labrador

À l'Université Memorial, Blair Winsor, Ph. D., et Ken Carter ont lancé le sondage au campus principal de St. John's et au campus Grenfell de Corner Brook, respectivement. Particulièrement active comme groupe de recherche, l'Université Memorial, et surtout le campus Grenfell, a aussi tenu des ateliers connexes sur la théorie des réseaux pour les universitaires concernés, une conférence fondée sur les travaux préliminaires destinée aux participants et aux représentants du gouvernement de toute la province et de dynamiques séances d'engagement communautaire à Corner Brook, et ont présenté des rapports à l'Institut Harris.

Les entreprises représentent 44 % des 330 nœuds de l'écosystème de Terre-Neuve, dont les données ont été recueillies à Corner Brook et à St. John's. Les entreprises sont principalement innovantes, mais quelques entreprises matures ont aussi été observées. Les organisations de soutien, pour leur part, correspondent à 19 % des nœuds. Le rang des organisations de soutien (qui arrivent derrière les entreprises innovantes) demeure le même d'un emplacement de collecte de données à l'autre. Les sociétés de capital risque et les institutions financières correspondent à 10 % des nœuds (5 % chacune). Il est intéressant de noter que les nœuds correspondant à des professionnels (13 %) sont plus nombreux que les nœuds correspondant à des institutions financières. Neuf pour cent des nœuds sont des ministères et organismes gouvernementaux, comme l'administration de l'aéroport de Deer Lake ou le ministère de l'Entreprise, du Tourisme, de la Culture et du Développement rural.

À Terre-Neuve, 43 % des demandes d'information (14 % + 29 % = 43 %) visaient de l'information technique, scientifique ou sur les produits, tandis que l'information commerciale, financière et sur les marchés représentait 78 % des demandes (47 % + 29 % = 78 %).

La centralité du graphe de Terre-Neuve est plutôt répartie; on ne retrouve pas un petit groupe de nœuds dans le centre. Cela est dû en partie au fait que les données du campus Grenfell (Corner Brook) ont été combinées à celles du sondage de St. John's. Les organisations qui offrent des services à des clients des deux emplacements et qui ont donc plus de contacts sont plus au centre, tandis que les autres sont légèrement en périphérie.

Fait saillant sur le marketing et la distribution

Le Centre Harris de St. John's a tenu une conférence intitulée People, Places and Public Engagement, qui a été en partie inspirée par ce travail. Blair Winsor et Ken Carter ont présenté le travail effectué aux campus de Corner Brook et de St. John's à un public composé de 30 universitaires et représentants du gouvernement, de l'industrie et de la collectivité.

Fait saillant sur le marketing et la distribution

À Corner Brook, une séance d'engagement communautaire et d'information a eu lieu pour des chefs de file du domaine universitaire et du domaine des affaires et des représentants du gouvernement provincial et d'administrations municipales alors que les résultats préliminaires commençaient à être révélés. Cette activité a attiré 26 personnes qui ont examiné le sondage et évalué les répercussions. Cette activité continue à susciter de l'intérêt à Corner Brook et pour certains grands fabricants de la région.

FIGURE 5 – TERRE-NEUVE-ET-LABRADOR
 (données des campus de St. John's et de Corner Brook de
 l'Université Memorial)

330 nodes 789 edges

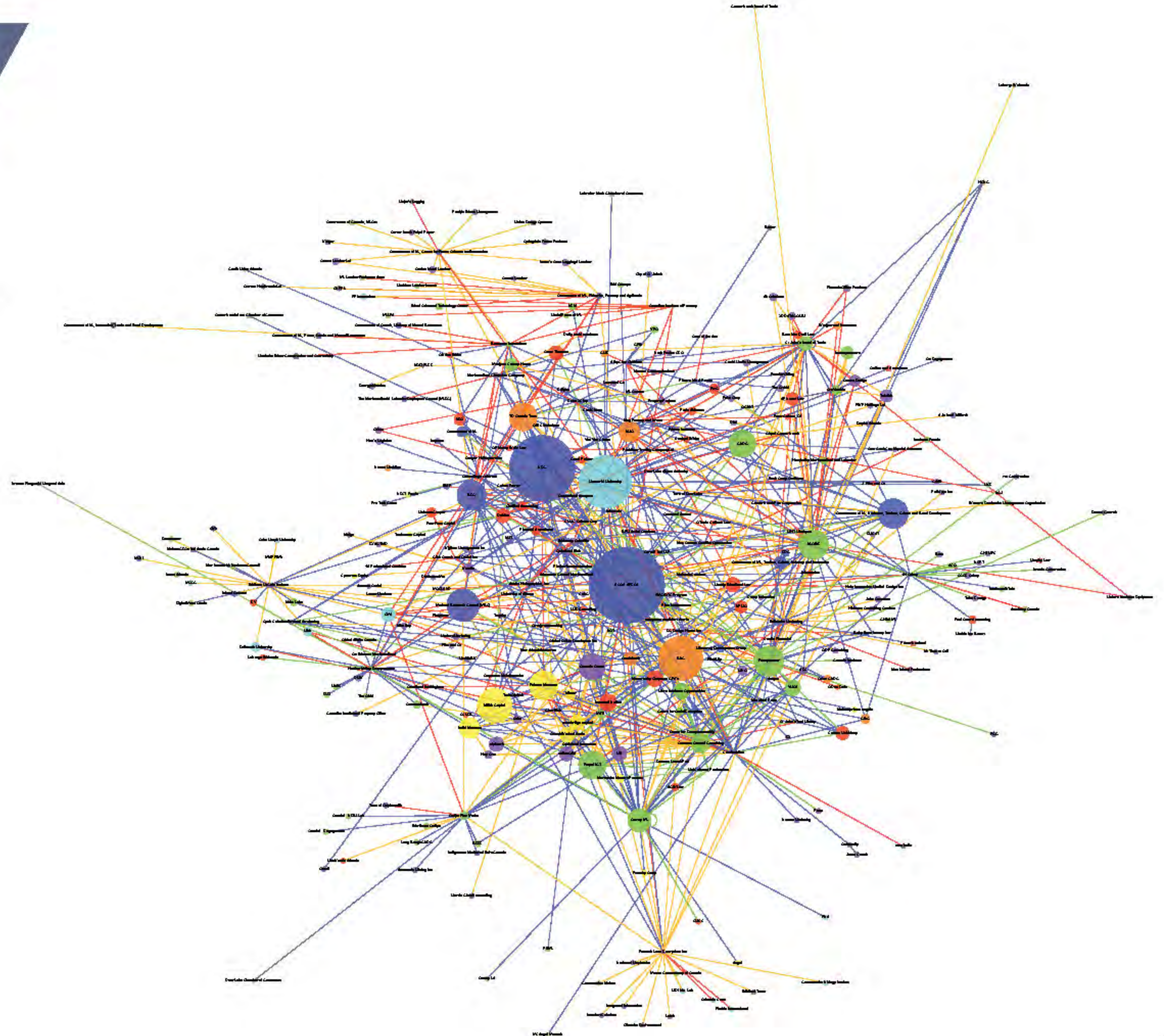
NODES

- Entrepreneurial Firm: 42%
- 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: 27%
- Both: 29%
- Neither: 10%



Île-du-Prince-Édouard

Tableau 9 - Centralité des nœuds à Terre-Neuve (classés par degré)

Nom	Degré entrant	Degré sortant	Degré	Degré entrant pondéré	Degré sortant pondéré	Degré pondéré
APECA	37	17	54	226	114	340
NLOWE	15	37	52	81	195	276
Université Memorial	22	28	50	153	198	351
Futurpreneur	17	25	42	83	133	216
Startup NL	15	27	42	62	123	185
Common Ground Coworking	10	25	35	48	158	206
BDC	33	0	33	194	0	194
Centre Genesis	14	17	31	71	109	180
RBC	22	0	22	127	0	127
Gouvernement de T.-N.-L., Entreprise, Tourisme, Culture et Développement rural	15	5	20	82	17	99
RDC	16	0	16	80	0	80
Pelorus Venture Capital	12	4	16	78	25	103
Killick Capital	15	0	15	97	0	97
Conseil national de recherches (CNRC)	15	0	15	90	0	90
TD Canada Trust	15	0	15	77	0	77
Propel ICT	15	0	15	76	0	76
Noseworthy Chapman, CPA	6	7	13	39	43	82
Build Ventures	10	2	12	53	14	67
CBDC	11	0	11	74	0	74
BMO	10	0	10	54	0	54
YMCA	7	0	7	38	0	38
Benson & Buffett	6	0	6	42	0	42
Metro Business Opportunities	6	0	6	38	0	38
GrowthWorks Atlantic	5	0	5	35	0	35
M5	5	0	5	35	0	35

Les répondants au sondage de l'UPEI administré par Susan Graham, Ph. D., étaient des entreprises à 59 %. Mme Graham a profité de son expérience en développement économique pour contribuer à bâtir diverses organisations qui ont pu aider à établir une base de données de la population à sonder. Comme c'était généralement le cas ailleurs aussi, les organisations de soutien constituaient 16 % des nœuds de la province. Les sociétés de capital risque (2 %) tirent de l'arrière par rapport aux institutions financières (8 %) parmi les organisations auprès desquelles les entreprises et autres acteurs de l'industrie ont obtenu de l'information. Trois ou quatre universités et collèges ont été signalés, ce qui correspond à 2 % des nœuds. Les organisations professionnelles correspondaient à 9 % des nœuds, et les gouvernements comptaient pour 4 %.

La majeure partie de l'information demandée était de nature commerciale, financière ou sur les marchés (60 % + 16 % = 76 %), suivie de l'information technique, scientifique et sur les produits (18 % + 16 % = 34 %).

La densité de la centralité est moins évidente dans ce graphe par rapport à d'autres, ce qui indique que les organisations approchées par les répondants pour obtenir de l'information en matière d'innovation étaient plus diversifiées.

Fait saillant sur le marketing et la distribution

À Charlottetown, des représentants de la Chambre de commerce, de sociétés de capital risque, de l'UPEI, de l'APECA, de Bioscience Incubator, et des domaines du développement économique et du tourisme ont participé à une discussion sur la place de l'Île-du-Prince-Édouard dans l'écosystème entrepreneurial de l'Atlantique lors d'une présentation des conclusions préliminaires. Des cartes expliquant comment les entreprises matures peuvent aider les entreprises en démarrage ont été créées pour l'activité.

FIGURE 7 – ÎLE-DU-PRINCE-ÉDOUARD (UPEI)

188 nodes 238 edges

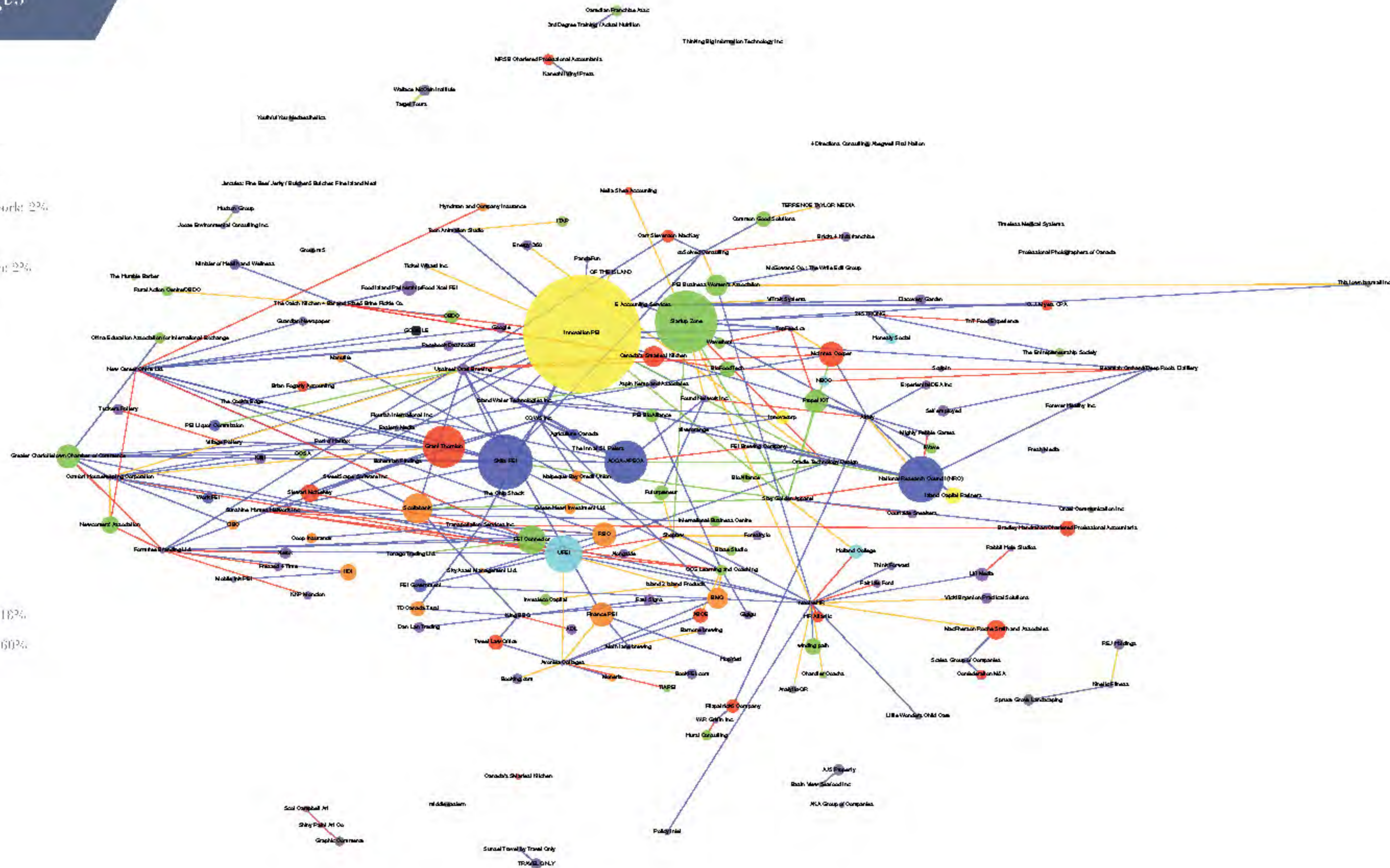
NODES

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



EDGES

- Product/Service/Technical: 16%
- Business/Market/Financial: 60%
- Both: 16%
- Neither: 8%



Nouvelle-Écosse

Tableau 10 - Centralité des nœuds à l'Île-du-Prince-Édouard (classés par degré)

Nom	Degré entrant	Degré sortant	Degré	Degré entrant pondéré	Degré sortant pondéré	Degré pondéré
Innovation PEI	21	0	21	148	0	148
Startup Zone	9	0	9	75	0	75
SkillsPEI	10	0	10	65	0	65
Conseil national de recherches (CNRC)	8	0	8	53	0	53
APECA	9	0	9	49	0	49
Grant Thornton	7	0	7	48	0	48
UPEI	9	1	10	42	7	49
Banque Scotia	5	0	5	32	0	32
PEI Connectors	6	0	6	30	0	30
McInnes Cooper	5	0	5	25	0	25
Chambre de commerce du Grand Charlottetown	4	4	8	24	19	43
Finance PEI	4	0	4	24	0	24
RBC	5	0	5	24	0	24
Propel ICT	4	0	4	23	0	23
PEI Business Women's Association	4	0	4	21	0	21
BMO	4	0	4	20	0	20
Canada's Smartest Kitchen	2	0	2	20	0	20
MacPherson Roche Smith and Associates	2	0	2	18	0	18
Stewart McKelvey	3	0	3	16	0	16
Newcomers' Association	3	0	3	15	0	15
Island Capital Partners	2	0	2	14	0	14
winding path	1	0	1	14	0	14
IIDI	2	0	2	14	0	14
Bradley Handrahan Chartered Professional Accountants	2	0	2	13	0	13

Dans les résultats de la Nouvelle-Écosse, 56 % des nœuds étaient des entreprises (un total de 427 entreprises). Une analyse réalisée par la suite a indiqué qu'un petit nombre de ces entreprises étaient matures. Les organisations de soutien représentaient 15 % des nœuds. En Nouvelle-Écosse, les sociétés de capital risque correspondaient à 11 % des nœuds. Cette anomalie (par rapport aux autres provinces) est attribuable au fait que les entreprises de capital risque Innovacorp et Build Ventures ont répondu au sondage en fournissant beaucoup de détails. Puisque beaucoup de sociétés de capital risque avaient discuté avec d'autres sociétés de capital risque, ces dernières sont incluses dans les données. Les universités, les instituts de recherche et les collèges représentaient 4 % des nœuds. Les services professionnels correspondaient à 6 % des nœuds, et les gouvernements, à 5 %.

Fait saillant sur le marketing et la distribution

Lorsque le projet était en cours de déploiement, une conférence a eu lieu à l'Université Saint Mary's pour discuter du travail qu'il restait à faire. Elle a attiré 134 personnes de toute la région de l'Atlantique et de l'Ontario. La conférence, qui a duré une journée et demie, était grandement axée sur les décideurs et leurs influenceurs et a attiré l'attention sur le travail, les participants et le potentiel du projet d'explorer davantage les possibles conclusions sur l'écosystème entrepreneurial de l'Atlantique, qui est en pleine émergence et connaît du succès.

FIGURE 8 – NOUVELLE-ÉCOSSE (SMU)

763 nodes **1472 edges**

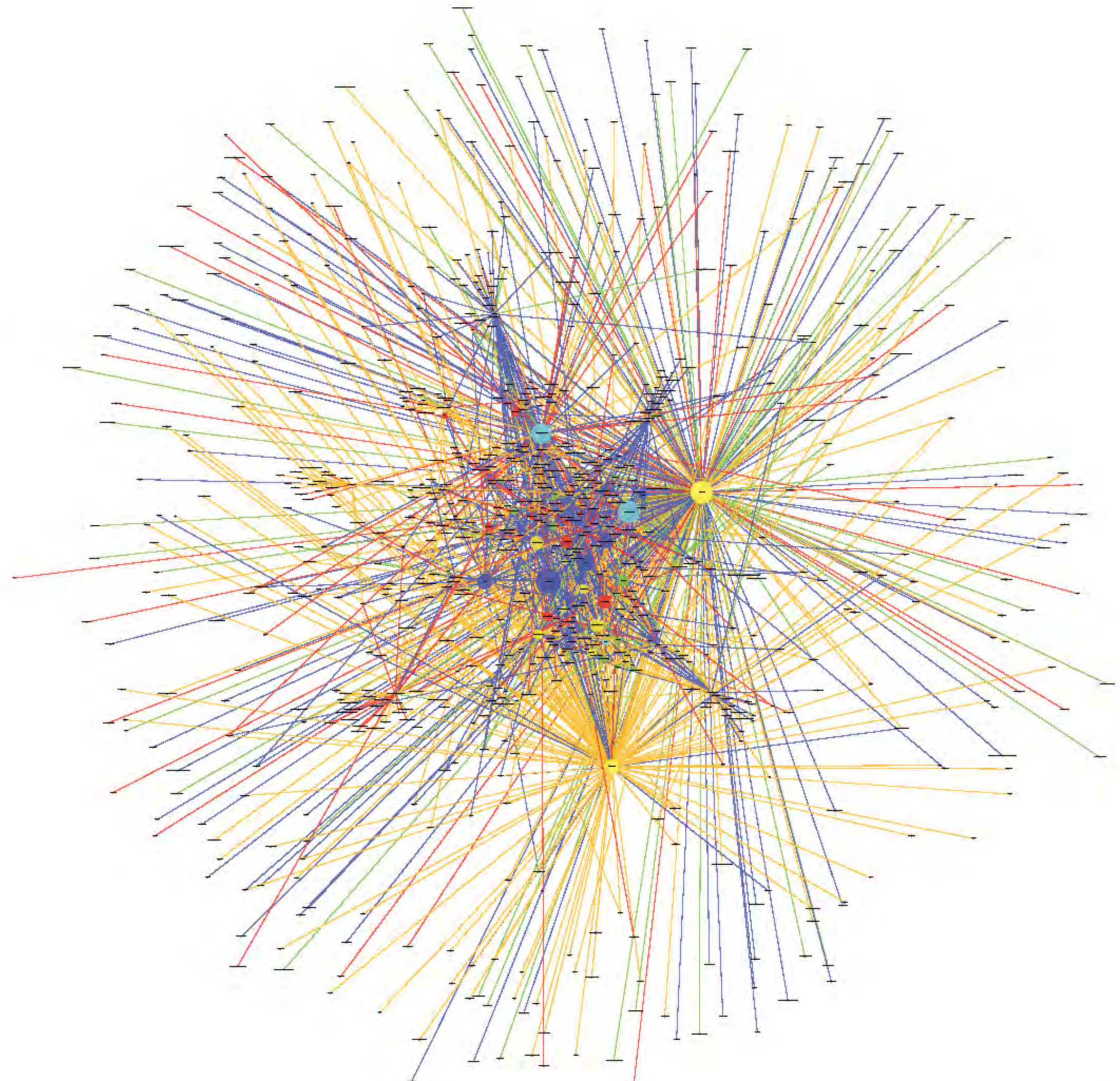
NODES

- 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: 36%
- Neither: 8%



Parmi les 1 472 activités de quête d'information, 79 % visaient de l'information commerciale, financière et sur les marchés (41 % + 38 % = 79 %), et 51 % visaient de l'information technique, scientifique et sur les produits (13 % + 38 % = 51 %).

La centralité est évidente dans ce graphe. Trois acteurs sont toutefois plus en périphérie. Il s'agit d'Innovacorp, de l'Université Saint Mary's et de Build Ventures. Ces nœuds sont de toute évidence grandement sollicités pour obtenir de l'information (compte tenu de leur taille et des nombreuses arêtes qui en émanent), mais ils sont en contact avec des nœuds à l'extérieur du centre.

Tableau 11 - Centralité des nœuds en Nouvelle-Écosse (classés par degré)

Nom	Degré entrant	Degré sortant	Degré	Degré entrant pondéré	Degré sortant pondéré	Degré pondéré
Innovacorp	29	283	312	263	2 536	2 799
Build Ventures	17	178	195	161	954	1 115
Université Saint Mary's	21	73	94	225	313	538
NSBI	21	60	81	167	400	567
APECA	33	31	64	286	209	495
GrowthWorks Atlantic	11	35	46	94	276	370
RBC	16	25	41	87	117	204
Springboard Atlantic	11	22	33	66	129	195
Cox & Palmer	15	9	24	120	56	176
Université Dalhousie	21	0	21	245	0	245
McInnes Cooper	21	0	21	156	0	156
BDC	19	0	19	189	0	189
Halifax Partnership	10	8	18	70	36	106
Conseil national de recherches (CNRC)	18	0	18	160	0	160
First Angel Network	18	0	18	139	0	139
East Valley Ventures	16	0	16	141	0	141
Volta Labs	16	0	16	127	0	127
FINB	13	0	13	93	0	93
Entrepreneurs' Forum	13	0	13	78	0	78
Launch 36	12	0	12	69	0	69
Atlantic Angels	11	0	11	95	0	95
Grant Thornton	10	0	10	85	0	85
Stewart McKelvey	10	0	10	98	0	98

Île du Cap-Breton

Le travail à Cap-Breton a été réalisé par Kevin McKague, Ph. D., Dannie Brown, Ph. D., et Stephanie Gilbert, Ph. D., à l'Université Cape Breton. Dans une merveilleuse manifestation d'enthousiasme, ils ont travaillé avec bon nombre de sommités et d'organismes locaux pour tenir un blitz d'entrepreneuriat visant à promouvoir le projet et à encourager la participation de l'écosystème entrepreneurial local.

Les répondants de Cap-Breton ont mentionné 70 entreprises pour leurs activités de quête d'information (39 % des 178 nœuds). Trente et un pour cent des nœuds étaient des organisations de soutien. Au total, 5 % des nœuds correspondaient à des sociétés de capital risque et des institutions financières, et 3 % des nœuds étaient des universités, des collèges ou des instituts de recherche. Les entreprises professionnelles représentaient 10 % des nœuds, tout comme les organismes gouvernementaux.

Les 263 activités de quête d'information visaient principalement de l'information commerciale, financière et sur les marchés (54 % + 29 % = 83 %), tandis que l'information technique, scientifique et sur les produits comptait pour 43 %.

L'absence de centralité dans la figure 4 est intéressante. Il y a très peu de regroupement vers le centre, et même les plus gros nœuds (qui sont gros parce qu'ils ont reçu beaucoup de demandes et ont fourni de l'information jugée très utile par les demandeurs) sont en périphérie, ce qui indique que ces nœuds ont eu des contacts avec des nœuds à l'extérieur du centre.

Fait saillant sur le marketing et la distribution

Soixante-cinq personnes ont participé aux présentations des résultats de Cap-Breton relatifs aux conclusions préliminaires sur l'écosystème entrepreneurial de l'Atlantique, qui ont eu lieu en même temps que la Community Innovation and Enterprise Conference à la Shannon School of Business. Les gens se sont précipités pour obtenir des exemplaires des graphes et les ont fait circuler pendant qu'un groupe de six universitaires faisait part de ses observations.

FIGURE 6 – DONNÉES DU CAP-BRETON (CBU)

178 nodes 263 edges

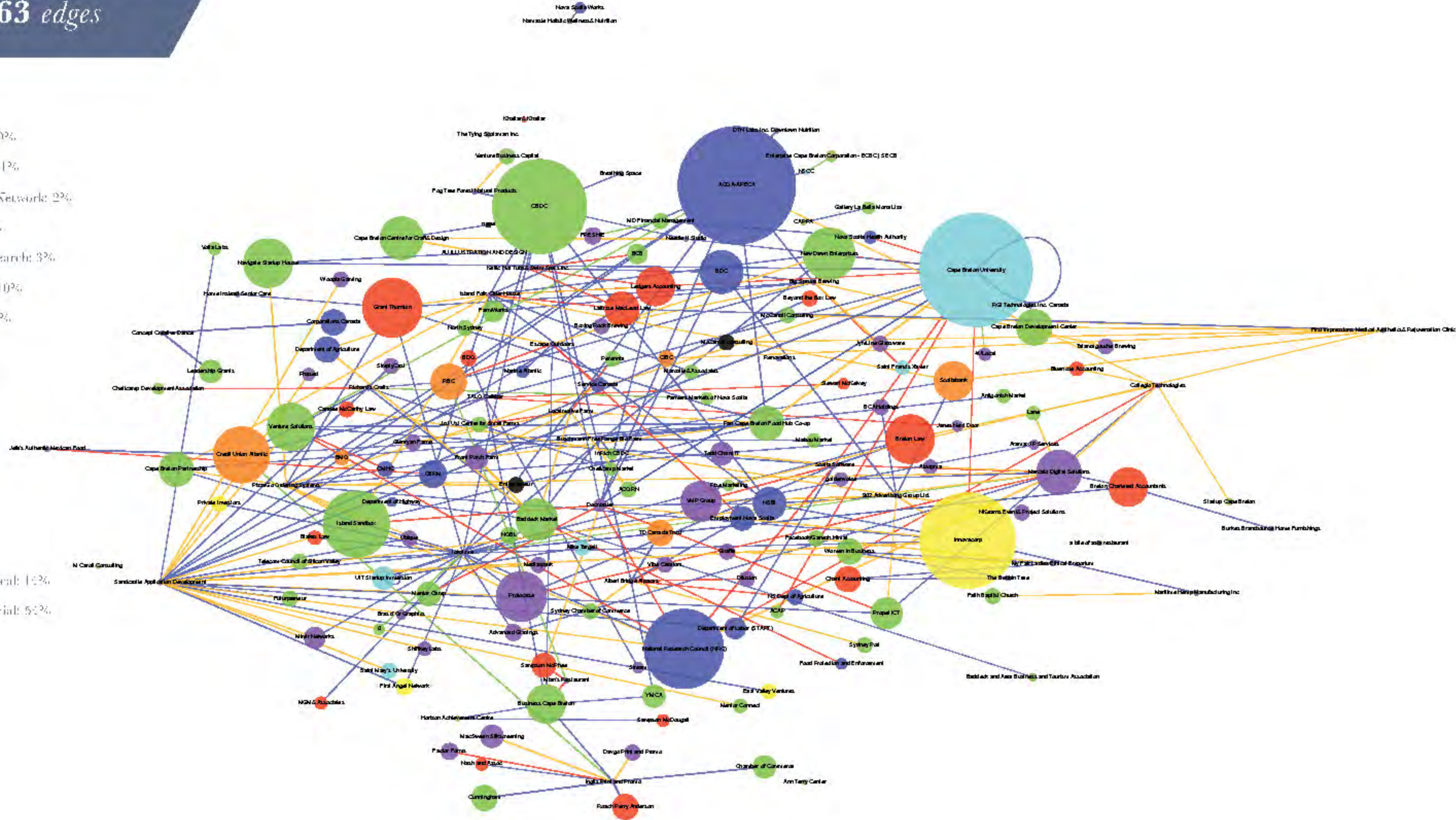
NODES

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



EDGES

- Product/Service/Technical: 1%
- Business/Market/Financial: 51%
- Both: 29%
- Neither: 3%



CONCLUSIONS ET RÉSULTATS

Tableau 12 - Centralité des nœuds au Cap Breton (classés par degré)

Nom	Degré entrant	Degré sortant	Degré	Degré entrant pondéré	Degré sortant pondéré	Degré pondéré
Université Cape Breton	10	8	18	74	48	122
Marcato Digital Solutions	5	7	12	27	47	74
APECA	11	0	11	77	0	77
CBDC	10	0	10	61	0	61
Baddeck Market	4	6	10	25	25	50
Pan Cape Breton Food Hub Co-op	3	7	10	20	58	78
Innovacorp	8	0	8	62	0	62
Conseil national de recherches (CNRC)	8	0	8	51	0	51
Grant Thornton	6	0	6	37	0	37
Venture Solutions	3	3	6	29	18	47
Business Cape Breton	5	1	6	23	6	29
Island Sandbox	5	0	5	42	0	42
Credit Union Atlantic	5	0	5	35	0	35
New Dawn Enterprises	5	0	5	32	0	32
Protocase	5	0	5	31	0	31
Breton Law	4	0	4	30	0	30
BDC	4	0	4	26	0	26
Banque Scotia	4	0	4	23	0	23
Breton Chartered Accountants	4	0	4	23	0	23
Ledgers Accounting	4	0	4	23	0	23
RBC	4	0	4	21	0	21
Navigate Startup House	3	0	3	30	0	30
Cape Breton Centre for Craft & Design	3	0	3	26	0	26
VMP Group	2	0	2	24	0	24
Cape Breton Development Center	2	0	2	21	0	21

L'étude du contexte des écosystèmes entrepreneuriaux comporte de nombreuses variables associées au maintien d'un avantage régional : une combinaison de communauté, de réussite, de concentration de talents universitaires, de bassins croissants de fonds de capital risque et de capacité des experts à adopter de nouveaux paradigmes [6]. Certains travaux ont souligné les groupes d'éléments qui contribuent à l'écosystème et ont bâti des modèles qui illustrent le flux des activités parmi les groupes [p. ex. 7, 8]. D'autres travaux ont bâti des modèles économiques à partir de données sur les dépenses et les investissements liés à l'écosystème, par exemple [9]. Autio, Kenney et coll. [1] ont établi un cadre d'enquête sur les écosystèmes entrepreneuriaux dans le contexte de l'industrie, de la technologie, de la politique sociale et de l'organisation et sur les préoccupations stratégiques connexes, mais aussi sur les systèmes d'innovation temporels et mondiaux, nationaux et régionaux. Certains travaux de recherche sur les écosystèmes sont fondés sur des données de sondage portant sur des mesures comme les décisions relatives à l'emplacement [10] et sur des analyses interprétatives qui conduisent à des propositions construites sur des théories [11]. Une analyse longitudinale des réseaux d'inventeurs a souligné l'émergence de pôles et de réseaux dans des classifications industrielles données [12].

La quête d'information des éléments d'un écosystème met les fondateurs en contact avec des compétences et des ressources complémentaires qui leur permettent d'accéder à de nouvelles idées et personnes. Les relations personnelles, délibérées et officielles mesurées ici sont des méthodes actives de communication; les participants devaient décrocher le téléphone, envoyer un courriel ou tenir une réunion en personne pour que les points de données soient pris en compte. Les innovateurs et fondateurs en haute technologie exploitent les possibilités existantes et déploient leur réseau pour établir de nouvelles relations qui contribuent à créer de nouvelles possibilités [13]. De plus, les entrepreneurs en technologie (comme beaucoup dans cette région qui compte une abondance d'universités) préfèrent les réseaux solides et denses qui facilitent le transfert de savoir technique implicite et pointu [14].

L'objet de ce travail d'envergure consiste à enquêter sur la curiosité des participants d'un écosystème entrepreneurial et sur la mesure dans laquelle les jeunes entreprises cherchent de l'information pour faire progresser leurs projets, ainsi qu'à évaluer de façon plus structurée les relations entre les différents groupes d'acteurs. Pour ce faire, on a enquêté sur les comportements de quête d'information et on a eu recours à la théorie des réseaux pour illustrer la répartition des activités de quête d'information et pour établir et quantifier des mesures parmi les différents éléments et entre ceux-ci. On présente donc le contexte en évitant de se pencher sur l'entreprise ou l'entrepreneur et en examinant plutôt les relations entre les participants de l'écosystème.

Il est important de se souvenir qu'il ne s'agit pas d'une étude pour déterminer qui connaît qui. Il ne s'agit pas d'une étude sur les réseaux sociaux ni d'une étude sur les comptes LinkedIn, Twitter, Facebook ou Instagram. Il ne s'agit pas d'une étude conçue à partir de mégadonnées qui existaient déjà. Il s'agit d'une enquête bâtie avec soin à l'aide de données de sondage afin de montrer qui sont les acteurs de l'écosystème entrepreneurial du Canada atlantique en examinant qui communique avec qui. Vous reconnaîtrez la plupart des participants de notre écosystème. D'autres vous seront complètement inconnus.

1. COMPLEXITÉ DES ACTIVITÉS DE QUÊTE D'INFORMATION

Les activités de quête d'information de l'écosystème entrepreneurial de l'Atlantique (EEA) sont très complexes. L'EEA compte 1 666 organisations (les nœuds de différentes couleurs qui montrent de quel groupe elles font partie) et 3 397 activités de quête d'information distinctes (les lignes entre les nœuds).

Tableau 13 - Statistiques sur le réseau de l'écosystème entrepreneurial de l'Atlantique par emplacement de collecte de données

	Total	MUN	UNB	UdeM	UPEI	SMU	CBU
Nœuds	1 666	330	250	151	188	763	178
Arêtes	3 397	789	250	250	238	1 472	263
Degré moyen	2,039	2,391	1	1,656	1,266	1,929	1,478
Degré moyen pondéré	10,951	13,194	6,572	9,265	7,548	12,595	9,758

Cinquante-sept pour cent des nœuds dans l'EEA représentent des entreprises, tant innovantes que matures. Le deuxième groupe en importance mentionné par les répondants regroupe les organisations de soutien, avec un total de 17 %. Il s'agit de 283 organisations de soutien mentionnées spontanément par les fondateurs. Celles-ci englobent les groupes de présentation, les concurrents, les incubateurs, les accélérateurs, les centres d'entrepreneuriat, les services de mentorat et différents autres programmes.

Ensemble, les sociétés de capital risque et les investisseurs providentiels (7 %) et les organisations financières (4 %) représentent 11 % des éléments de l'écosystème mentionnés par les répondants. Les entreprises professionnelles représentent 8 % des nœuds et les gouvernements et autres organismes correspondent à 7 % des nœuds. Les universités représentent 3 % des nœuds, pour un total de 49 universités, collèges et universités techniques. L'Université d'Éthiopie en fait partie. Ce n'est pas une erreur. Cela signifie qu'un répondant au sondage a communiqué avec l'Université d'Éthiopie pour trouver une réponse à une question qui avait des répercussions sur ses intérêts commerciaux. Les gouvernements fédéraux et provinciaux de différents types et les entreprises professionnelles représentent la majeure partie des autres organisations nommées.

Les tableaux pour chacun des emplacements de collecte de

données ne doivent pas être interprétés trop littéralement. Chaque université comptait deux emplacements de collecte de données, sauf l'UPEI. De plus, les résultats visent à donner un aperçu de l'écosystème entrepreneurial de l'Atlantique. Il est encourageant de constater que les provinces se parlent entre elles et que les entrepreneurs, les organisations de soutien, les gouvernements et les sociétés de capital risque établissent des contacts à l'extérieur de leurs frontières immédiates et étendues. First Angel Network se trouve dans les données de Moncton, et le Centre for Women in Business se trouve dans les données de l'UNB. La FINB et East Valley Ventures se trouvent dans les données de SMU. Ce devrait être l'objectif de tout écosystème efficace : franchir d'abord les frontières provinciales, puis établir des contacts à l'extérieur du Canada atlantique.

Chose surprenante, le groupe de participants qui s'est démarqué dans l'approche constructiviste adoptée ici est celui des conseillers professionnels. Lorsqu'on leur a demandé de dresser leur propre liste d'activités de quête d'information, les répondants ont tous mentionné des professionnels, et plus particulièrement des cabinets d'avocats. Jusqu'ici, ce groupe n'avait pas été mentionné de façon aussi évidente dans les travaux de recherche sur l'écosystème entrepreneurial. Les personnes qui dessinaient les écosystèmes entrepreneuriaux ou qui prescrivaient les organisations dominantes et centrales ne plaçaient pas les avocats et les entreprises professionnelles au centre.

Apparemment, la quête d'information professionnelle revêt une importance particulière. La collectivité juridique a réagi avec un intérêt marqué à cultiver une clientèle du domaine de l'entrepreneuriat: les cabinets d'avocats sont présents dans les incubateurs et les accélérateurs, ils font de la publicité auprès des entreprises en démarrage, ils tiennent des cliniques gratuites aux endroits qui comptent de nombreuses entreprises en démarrage, ils sont heureux de livrer des allocutions dans les universités et ils parrainent des activités d'entrepreneuriat. Les cofondateurs sont de plus en plus nombreux à constituer leur entreprise en corporation en raison des importants efforts promotionnels des cabinets d'avocats et de la recherche de financement. Pour obtenir du financement officiel, il faut avoir recours à des services juridiques pour faire interpréter les listes de conditions, élaborer des tableaux de la structure du capital, respecter les dates de clôture et assurer la supervision des contrats.

2. LA FORCE DU NOMBRE

L'écosystème défini par les entrepreneurs comprend différents types d'éléments. Ceux qui sont ressortis sont semblables à ceux représentés dans des analyses observationnelles plus générales des écosystèmes entrepreneuriaux. L'analyse effectuée ici est plus quantitative et détaillée et apporte une nouvelle profondeur. Dans le Tableau 15 – Rendement de l'écosystème après élimination de certains groupes on a calculé le rendement de l'ensemble de l'EEA. Pour comparer l'importance relative des différents groupes, les principaux groupes ont été retirés de l'écosystème et les statistiques ont fait l'objet d'un nouveau calcul. Les options de quête d'information de l'EEA sont optimisées lorsque tous les groupes principaux sont en place. Si on retire l'un ou l'autre de ces groupes (sauf les entrepreneurs, évidemment), le degré moyen des comportements de quête d'information diminue.

Tableau 14 - Rendement de l'écosystème après élimination de certains groupes

	EEA	EEA moins gouvernement	EEA moins organisations de soutien	EEA moins universités, collèges, recherche	EEA moins capital risque, investisseurs providentiels
NŒUDS	1 666	1 550	1 397	1 614	1 567
ARÊTES	3 397	2 378	2 335	2 906	2 861
DEGRÉ MOYEN	2,039	1,534	1,671	1,800	1,826
DEGRÉ MOYEN PONDÉRÉ	10,951	7,56	9,22	9,63	9,69

Cette interdépendance des groupes est largement illustrée dans les graphes présentés plus tôt. Toutefois, les mesures associées aux analyses montrent que l'efficacité des comportements de quête d'information de l'écosystème diminue lorsque l'un des grands éléments non entrepreneuriaux est retiré. La valeur supplémentaire que chaque groupe apporte à l'écosystème montre la synergie au sein du groupe rassemblant entrepreneurs, gouvernements, groupes de soutien, professionnels et sociétés de capital risque. Si on retire l'un ou l'autre de ces groupes d'acteurs, le degré moyen des comportements de quête d'information diminue. L'EEA présente davantage d'activités de quête d'information (davantage

de quête d'innovation et d'entrepreneuriat) lorsque tous les grands groupes sont en place.

De nombreux travaux ont reconnu l'importance des décideurs, des universités, des entreprises matures et des investisseurs [voir 15]. Cependant, la plupart de ces travaux ne sont pas quantitatifs, ne sont pas fondés sur un sondage et ne sont pas axés sur la quête d'information. Le présent travail montre la quantité d'activités de quête d'information qui existe au sein d'un écosystème fonctionnel dans lequel les jeunes entreprises établissent des contacts pour obtenir de l'aide.

Par contre, les communications des gouvernements, des universités, des cabinets d'avocats et des autres sociétés de capital risque (sauf quelques exceptions dignes de mention comme Build Ventures et Innovacorp, qui ont répondu au sondage en détail) n'apparaissent pas dans ce travail. Ils répondent visiblement à des demandes d'entrepreneurs, mais les gouvernements, universités, cabinets d'avocats et investisseurs communiquent-ils entre eux? Entrent-ils en contact avec des entrepreneurs? Entrent-ils en contact avec des organisations à l'extérieur du pays et du continent? Ces groupes tentent-ils de renforcer l'écosystème local en obtenant de l'information auprès d'autres écosystèmes ailleurs sur la planète? Les membres des différents groupes apportent-ils de l'information novatrice sur la scène locale en discutant avec des personnes d'autres écosystèmes et en tirant des leçons auprès d'elles? La nature des questions du sondage dissuade certains organismes d'y répondre.

La recherche existante corrobore ce fait. Les gouvernements ne peuvent pas agir seuls pour mettre en place ou créer un écosystème entrepreneurial, ni donner de mandat à cette fin [16]. Ce sont plutôt les contributions à la création de valeur de nombreux acteurs qui sont fortement liés entre eux et qui travaillent de concert [17] qui font en sorte que l'écosystème est fonctionnel. Toutefois, les gouvernements ont joué un rôle important dans de nombreux grands écosystèmes du monde. Par exemple, le succès d'Israël est attribuable à un important programme gouvernemental de soutien au développement et à une culture entrepreneuriale sous-jacente. Ce petit pays isolé a une économie intérieure moins importante que celle d'autres grands centres entrepreneuriaux dans le monde, mais il a établi et maintenu des liens significatifs à l'international [18]. À Munich, la collaboration entre des universités qui sont normalement en concurrence est rendue possible grâce à du financement privé. Les efforts visent différents programmes et niveaux universitaires (recherche, curriculum, mentorat, incubateurs, etc.) [19].

La situation de la Belgique est semblable à celle de la région de l'Atlantique. Dans le cas de la Belgique, le gouvernement tente de développer les possibilités d'une économie régionale qui a perdu l'industrie manufacturière qui constituait sa base. L'approche adoptée par la Belgique pour développer son petit marché intérieur consiste à se concentrer sur les entreprises de TI et les sociétés qui se lancent à l'international dès leur création (born-global). Pour ce faire, un organisme gouvernemental indépendant a été créé spécialement à cette fin [20].

Taiwan a créé une économie technologique en partie en s'appuyant sur les émigrés qui partaient pour la Silicon Valley. Cette initiative découlait directement d'interventions du gouvernement. Des

dizaines d'années plus tard, le super pôle technologique du pays est mis à l'épreuve; la fabrication se déplace vers des endroits où les coûts sont moins élevés et Taiwan est dépouillée de ses avantages économiques intérieurs [21]. Il y a quatre ans, lors d'une activité à la Silicon Valley avec le groupe C100, il a été souligné que 300 000 Canadiens travaillent à San Francisco. Trois cent mille! De quel genre de hausse la région de l'Atlantique pourrait-elle bénéficier si seulement une fraction des Canadiens (de la région de l'Atlantique) qui travaillent à la Silicon Valley ou à Seattle revenaient au pays avec une compréhension aiguë de l'identification des problèmes et une précision d'exécution hors pair.

Le seul groupe dont ce n'est pas le rôle de créer un écosystème entrepreneurial dynamique est celui des entrepreneurs. Les entrepreneurs doivent cerner des problèmes importants, trouver des façons de les résoudre, obtenir du financement pour y arriver, passer à l'action de manière à donner vie à la solution, trouver des clients volontaires et créer une correspondance produit-marché. Au sens figuré, le reste de l'écosystème est le personnel de soutien. La culture entrepreneuriale et les éléments qui la sous-tendent sont le fondement sur lequel les autres éléments appuient leurs programmes, leurs produits, leurs services et leur soutien – et un écosystème émerge. Toute défaillance sur ce plan est attribuable au fait que d'importants participants de l'écosystème agissent sans nouer le dialogue avec la communauté entrepreneuriale.

3. L'INFORMATION COMMERCIALE, FINANCIÈRE ET SUR LES MARCHÉS DOMINE LES ACTIVITÉS DE QUÊTE D'INFORMATION

Les activités de quête d'information des entrepreneurs de l'écosystème visent principalement l'information commerciale, financière et sur les marchés. Évidemment, l'information de cette nature dont les entrepreneurs peuvent tirer parti est plus abondante. Il n'est peut-être pas surprenant de constater que l'information commerciale domine l'information scientifique, technique ou sur les produits, mais cela demeure quelque peu préoccupant. La recherche de financement est le principal obstacle de tous les fondateurs et c'est pourquoi presque toutes les équipes spéciales de nouveau produit se concentreront sur l'aspect commercial. Pour leur part, les contacts établis pour stimuler l'innovation nécessiteront une curiosité axée davantage sur les aspects liés à la technique, au produit et à la conception afin de créer de nouvelles technologies et solutions.

Lorsque les entrepreneurs sont compétents en création, en conception et en production de produits ainsi qu'en sciences, leurs besoins en matière d'information tournent autour du développement de marchés, de la livraison, des aspects financiers

du produit, des techniques de vente et des méthodes pour bâtir une entreprise. Cette explication serait rassurante et c'est ce à quoi on s'attendrait de la part des entrepreneurs techniques qui font face à des défis sur le plan des ressources et capacités commerciales et financières.

D'un autre côté, ce résultat pose problème si les entrepreneurs n'ont pas suffisamment de ressources sur le plan de la technique, de la conception et de l'innovation pour être concurrentiels, mais qu'ils consacrent du temps à obtenir des conseils commerciaux et financiers. Si les équipes spéciales de nouveau produit concentrent leur quête d'information sur les activités de développement des affaires en apportant peu d'améliorations à la conception ou à la création des produits, voire aucune, les difficultés liées à l'imaturité des innovations pourraient les empêcher de mettre au point des modèles d'affaires durables.

4. TROP CENTRÉ SUR L'ATLANTIQUE

L'interdépendance des éléments de l'EEA est très bien soulignée dans les graphes de la section Analyse. Dans deux sous-groupes de données, on a analysé l'emplacement des répondants et de leurs homologues. L'évaluation géographique a révélé qu'il y avait davantage de nœuds au Canada atlantique et en Amérique du Nord, ce qui est plutôt préoccupant. Dans la Figure 9 – Sous-groupe de données – Emplacement géographique des nœuds (personnes), environ 75 % des nœuds étaient situés dans la région de l'Atlantique. Quinze pour cent des nœuds étaient dans

le reste du Canada et neuf pour cent étaient aux États-Unis, ce qui est encourageant. Seulement 1 %, ou 30 activités de quête d'information, se situaient à l'international, à l'extérieur de l'Amérique du Nord.

Dans l'autre sous-groupe de données, l'examen de l'emplacement géographique des contacts établis par les organisations a permis d'observer des proportions différentes, mais semblables. Le Canada atlantique était la source de 25,9 % des activités de quête d'information, et 4,1 % de ces activités (40 des 984 activités de quête d'information de l'échantillon) étaient classées sous « Reste du monde », ce qui signifie à l'extérieur de l'Amérique du Nord.

De façon générale, 25 % des activités de quête d'information effectuées par des personnes et des organisations de l'EEA ne sont pas à proximité de l'emplacement géographique du Canada atlantique; elles sont ouvertes sur le monde, soit vers le reste du Canada, les États-Unis ou ailleurs.

Ces chiffres semblent raisonnables, mais il existe peu de données auxquelles ils peuvent être comparés. Étant donné qu'il ne coûte pratiquement rien de communiquer avec une personne à l'autre bout de la planète, ne pourrait-il pas y avoir davantage d'activités de quête d'information ouvertes sur le monde? Les progrès qui accompagnent l'information obtenue à l'extérieur du cercle d'influence habituel franchissent les frontières et sont plus susceptibles de créer des innovations substantielles.

FIGURE 9 – SOUS-GROUPE DE DONNÉES –
EMPLACEMENT GÉOGRAPHIQUE DES NŒUDS
(PERSONNES)

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

- NS
- NB
- NL
- PEI
- Rest of Canada
- US
- Rest of the world

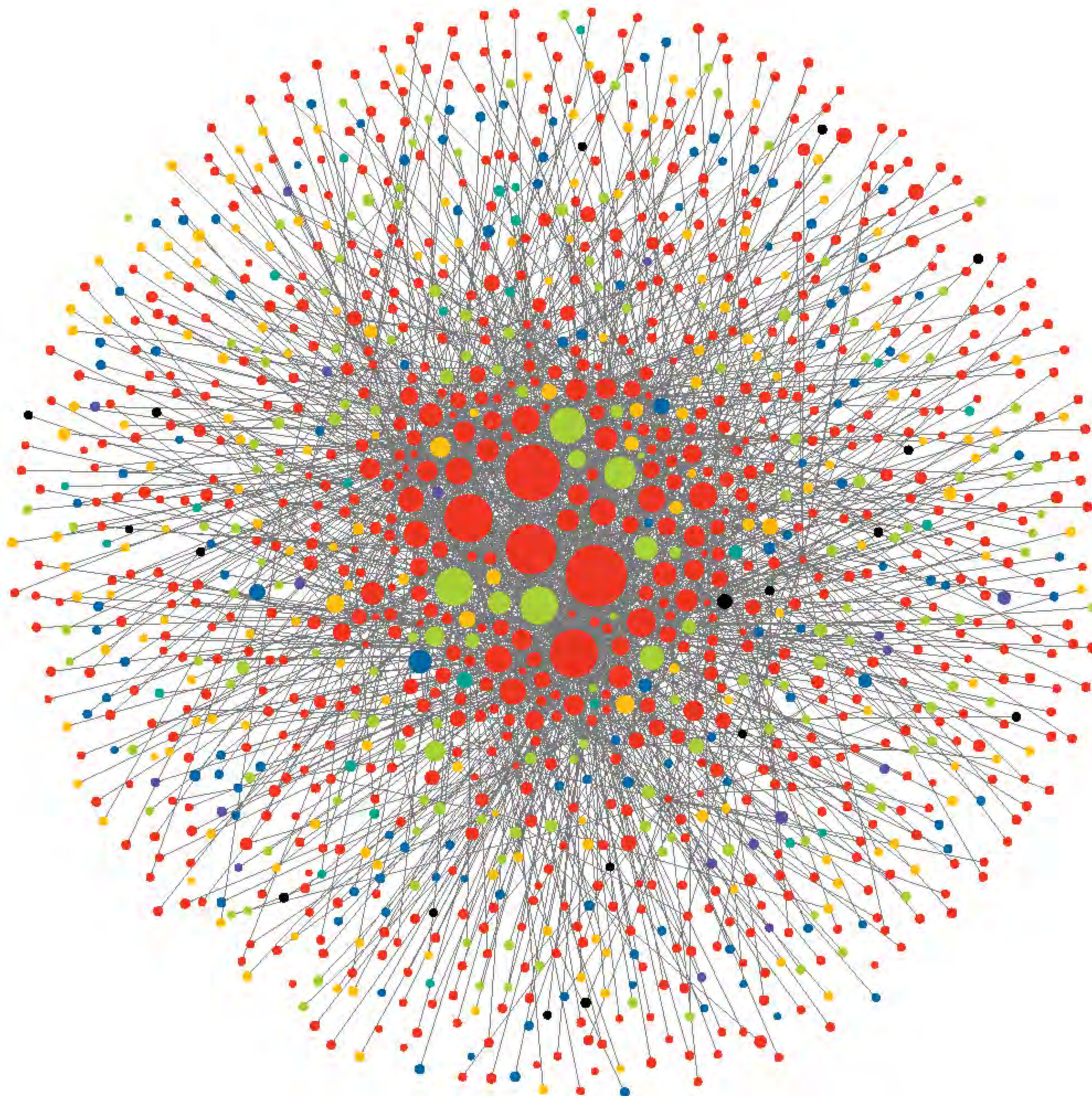
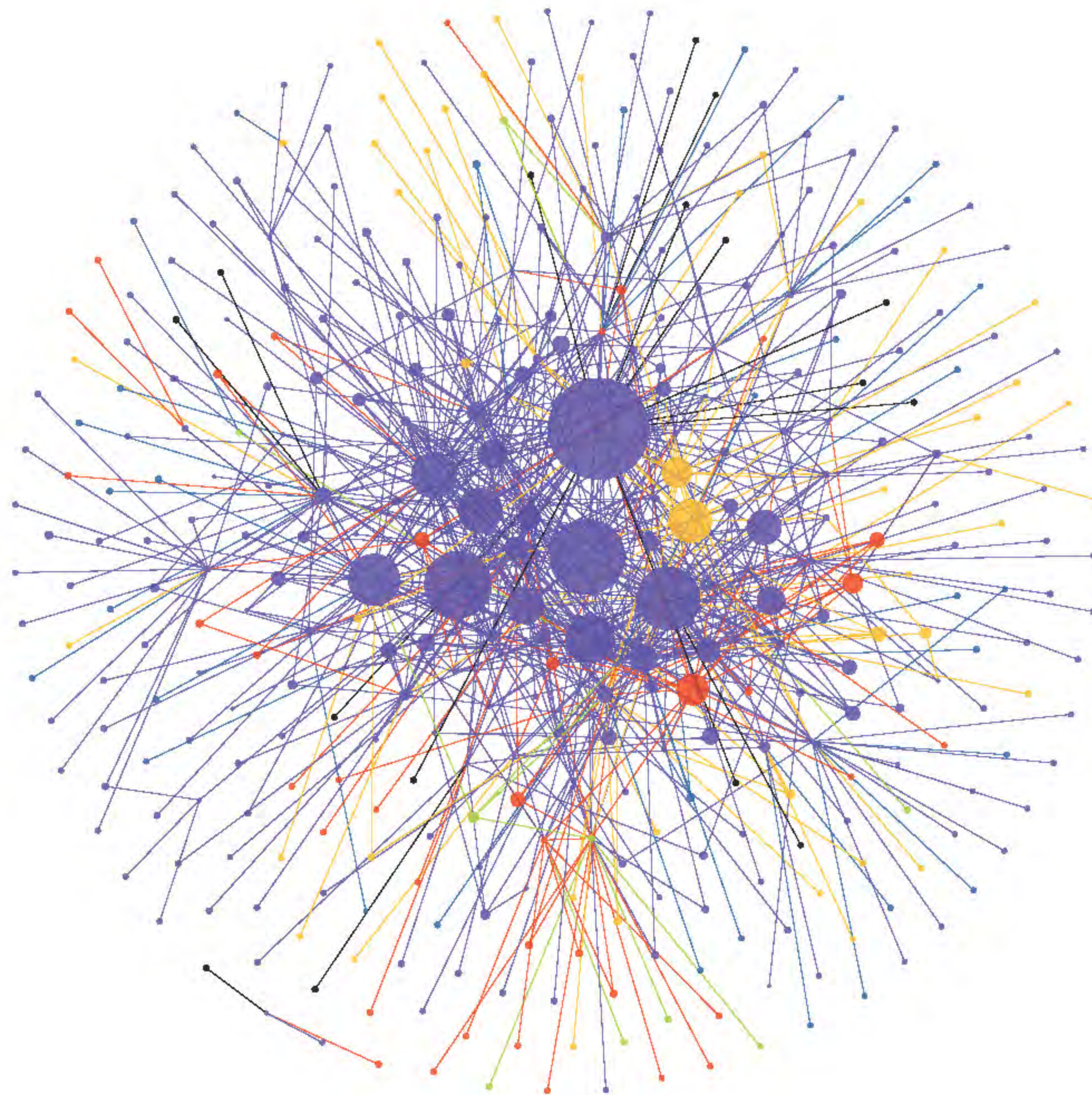


FIGURE 10 – SOUS-GROUPE DE DONNÉES –
EMPLACEMENT GÉOGRAPHIQUE DES NŒUDS
(ORGANISATIONS)

386 nodes **984 edges (arcs)**

- NS (0.62%)
- NB (2.33%)
- NL (63.72%)
- PEI (0.02%)
- Rest of Canada (11.12%)
- US (8.55%)
- Rest of the world (7.15%)



5. ASPIRATION À LA RECONNAISSANCE MONDIALE – ÉTABLIR UNE DISTANCE NUMÉRIQUE

L'établissement de contacts partout sur la planète est un aspect important de la réussite de l'écosystème. Partout sur la planète, les pôles et écosystèmes performants ont une portée géographique mondiale. Peu importe leur origine, ils jouissent d'un vaste réseau et n'évoluent pas en vase clos. Le Canada atlantique doit résister à la tendance isolationniste et éviter de mener la majeure partie de ses activités de quête d'information sur son propre territoire [22]. Si tous les acteurs de l'écosystème étendent leurs activités de quête d'information à l'extérieur de leur zone géographique, de nouveaux liens internationaux pourront être partagés, de nouvelles relations pourront se forger, les ressources pourront être combinées afin que l'écosystème soit représenté dans les missions commerciales dans d'autres écosystèmes, et d'autres écosystèmes pourront être invités à venir ici.

Nous avons beaucoup à dire. Si les écosystèmes et les pôles d'innovation qui réussissent le mieux se distinguent par leur portée internationale et que nous les connaissons, eux sont-ils au courant de notre existence? Le Canada atlantique a un écosystème actif et motivé, des entrepreneurs et fondateurs intelligents et talentueux, une foule d'universités et de connaissances axées sur la science et les affaires, et une main-d'œuvre jeune et internationale.

N'oublions pas l'abondance d'entrepreneurs qui se sont retirés avec succès. Le monde se précipite à notre porte pour acheter des capitaux propres au Canada atlantique. Voici une liste non exhaustive des entreprises qui ont acheté des fondateurs et investisseurs du Canada atlantique : Lynda.com (Compiler), Salesforce.com (Radian6 et Go Instant), IBM (Q1 Labs), Verisk Analytics (Analyze Re), Samsung (Pace Technologies), Venor (Equals6), AOL (Info InterActive), Patron Technology (Marcato Digital Solutions), American Forest Foundation (WoodsCamp), Croda International, R.-U. (Nautilus Biosciences Canada), Towers Warson (Brovada), Foto Search (CanStockPhoto), Royal DSM (Ocean Nutrition), Legado Capital (Kivuto Solutions), Allied Universal (Source Security and Investigations), Vinci Energies, France (ADM Systems Engineering), Quintiles IMS (STI Technologies), Gaming Labs International (Bullet Proof).

Les acteurs de l'écosystème peuvent élargir les relations et la promotion auprès d'écosystèmes extra-locaux :

- Établir de nouveaux liens internationaux avec d'autres

écosystèmes;

- Créer une coordination régulière du transfert de connaissances avec d'autres écosystèmes pour forger de nouvelles relations régionales;
- Créer et coordonner des « campagnes » pour faire connaître l'écosystème de l'Atlantique et son nombre croissant de fondateurs et d'investisseurs performants;
- Maintenir l'activité pour faire connaître davantage le Canada atlantique;
- Combiner les ressources pour participer à des missions commerciales et à des salons professionnels avec le mandat de cultiver la promotion de l'écosystème entrepreneurial de l'Atlantique;
- Trouver des « équivalents » professionnels dans d'autres provinces ou pays avec qui communiquer et demeurer en contact;
- Recruter et transmettre de l'information dans un écosystème donné, comme la Caroline du Nord, Boston, Londres, Chicago, Israël ou la Belgique.

Les pôles d'innovation les plus performants ont établi de nombreux liens à l'échelle mondiale et ils ont recours à leurs relations durables avec d'autres pôles pour améliorer leurs ressources, obtenir de l'information, accéder à des marchés et accélérer l'innovation. Même la fameuse Silicon Valley a manqué de place sur le plan géographique parce qu'elle est située dans une vallée isolée de chaque côté et a fini par se tourner vers d'autres régions du monde pour élargir son réseau [23]. Ces liens et les réseaux qu'ils bâtissent permettent aux participants de tirer des avantages supplémentaires, en plus de ceux attribuables aux groupes à proximité, et de réaliser des gains d'efficacité et des innovations à l'échelle mondiale [24, p. 27].

Les relations à l'international servent à jeter un pont entre les frontières, à combler les lacunes structurelles et à construire des réseaux. Elles encouragent la mobilité des ressources humaines entre les entreprises et les régions, favorisent le transfert de savoir-faire en haute technologie, encouragent la création d'entreprises qui se lancent à l'international dès leur création (born-global), augmentent la participation de groupes de soutien spécialisés au croisement des activités et des ressources, stimulent le déplacement des ressources humaines entre l'industrie et le milieu universitaire, et engendrent une connaissance pointue des mécanismes de soutien.

Fait saillant sur le marketing et la distribution

Pendant une présentation à un public international portant sur les liens faibles et la portée internationale, on a discuté avec Christopher Longhi, Ph. D., au grand parc de Sophia Antipolis, en France. M. Longhi a étudié le parc qui compte désormais 35 000 personnes en ayant recours à la théorie des réseaux et a affirmé qu'il y a trente ans, il comptait à peine plus de quelques centres de recherche d'entreprises matures. Dans l'objectif d'établir un contact, j'ai encouragé M. Longhi à visiter le Canada atlantique en lui indiquant qu'un grand nombre de chefs de file communautaires et politiques seraient intéressés à le rencontrer. Je communique avec lui à l'occasion pour m'assurer qu'il se souvient de l'écosystème entrepreneurial en Amérique du Nord qui se situe le plus près de lui.

Dans beaucoup d'analyses de réseaux sociaux, l'importance des nœuds est déterminée selon leur centralité. Si les nœuds sont reliés à beaucoup d'autres nœuds, c'est la quintessence de la popularité ou du prestige. Ceux qui sont les plus proches du centre et dont le score de centralité est le plus élevé sont les plus importants. La centralité est le concept qui répond à la question « Quels sont les nœuds les plus importants du réseau? »

Dans une recherche sur l'écosystème entrepreneurial comme celle-ci, qui enquête sur les activités de quête d'information, il n'est pas si évident que les types de centralité habituels décrits ci-dessus correspondent aux nœuds les plus importants. Le but est que ceux qui sont à proximité géographique établissent une distance numérique. Nous sommes ici, mais nous devons entrer en contact avec des gens là-bas. Comme le décrit l'article sur les liens forts et les liens faibles [25], les liens faibles qui franchissent les frontières structurelles (des gens qui obtiennent de l'information auprès d'autres personnes qu'ils connaissent indirectement, qu'ils ont rencontrés dans une conférence, qu'ils ont découvertes dans un article ou un journal scientifique) sont plus susceptibles de permettre d'obtenir de l'information riche en innovation. Ces gens jettent des ponts entre les réseaux, ce qui permet à l'information de passer d'un groupe à l'autre par l'entremise d'une personne. Cela ne comprendrait pas nécessairement le nœud qui est le plus sollicité de l'écosystème.

Dans le contexte d'un écosystème qui aspire à être plus ouvert sur le monde, ce ne sont pas les nœuds qui communiquent avec d'autres nœuds de la même région qui sont les plus importants. Ils sont assurément populaires. Si le but est d'atteindre un public international à l'extérieur de nos frontières, voire de notre continent, les nœuds qui sont de grande taille, mais qui se trouvent en périphérie des graphes, deviennent particulièrement importants. Ils ont de nombreux liens (ce qui fait en sorte qu'ils sont de grande taille sur les graphes), mais ils ne sont pas axés principalement sur les liens intérieurs se trouvant au centre; ils sont liés à de nombreux nœuds qui ont d'autres liens.

Par exemple, Greg Curwin de TruLeaf a importé l'agriculture verticale du Japon vers la Nouvelle-Écosse, le Nouveau-Brunswick et l'Ontario. Il lui a fallu quelques années pour convaincre les autres, mais après plusieurs rondes de financement, TruLeaf est aujourd'hui estimée dans les neuf chiffres. Greg n'a pas fait toute sa quête d'information dans l'écosystème local.

Un écosystème efficace et central sur le plan géographique devrait être distant sur le plan numérique lorsqu'on enquête du point de vue de la quête d'information, puisqu'il s'agit de la source de nouvelle innovation dans une région. Un écosystème distant sur le plan numérique se caractérise par des agents qui parcourent le monde à la recherche de réponses à des problèmes qu'ils souhaitent résoudre localement.

6. ADOPTER UN COMPORTEMENT DE QUÊTE D'INFORMATION QUI INTÈGRE LES LIENS FAIBLES

Dans les écosystèmes entrepreneuriaux ou les pôles d'innovation, les réseaux d'acteurs qui jouent leur rôle encouragent l'activité entrepreneuriale dans la région. Les participants de l'écosystème recueillent de l'information pour améliorer la mobilité des ressources humaines, des talents, du savoir-faire, du capital et d'autres actifs matériels et incorporels. L'établissement délibéré de contacts pour obtenir de l'information, ce qu'on appelle ici la quête d'information, ouvre les fondateurs à des compétences et ressources complémentaires auxquelles ils accèdent en développant de nouvelles connaissances et en rencontrant de nouvelles personnes.

La quête d'information auprès de simples connaissances est encore plus essentielle à l'innovation. Les personnes qui fournissent de l'information, mais qui sont de simples connaissances, sont des liens faibles. Les liens faibles sont importants, parce que la nouvelle information obtenue auprès de connaissances est plus susceptible d'être originale et unique que l'information obtenue auprès d'amis proches et de membres de la famille [26]. Les

personnes étudiées ici, qui établissent des contacts à l'extérieur du cercle d'influence habituel de la région, pourraient jeter des ponts entre divers domaines et toucher d'immenses rentes de situation [27]. Les progrès les plus importants en innovation surviennent lorsque les fondateurs combinent de l'information qui franchit les frontières du savoir, aussi appelées trous structuraux [27].

Les personnes qui obtiennent de l'information auprès de liens faibles analysent de l'information sur divers sujets et apportent des opinions différentes et des perspectives éclairées à leur projet. Le réseautage est une façon d'établir des liens faibles, surtout pour les innovateurs en haute technologie [13]. Les liens faibles peuvent aussi s'établir grâce au réseautage, aux demandes d'information, à la communication avec des connaissances, aux demandes ouvertes d'innovation, aux conférences, aux salons professionnels de l'industrie et autres interactions. Les liens faibles sont un élément essentiel dans le cadre des pôles d'innovation et de l'accélération de l'entrepreneuriat qui en découle, et s'établissent lorsque les participants de l'écosystème obtiennent de l'information auprès de groupes de soutien spécialisés, d'universités et de gouvernements ou encore lors de salons professionnels, de conventions, de rassemblements professionnels ou de collaborations avec l'industrie.

Prenons par exemple une entreprise figurant parmi les données qui s'appelle Rheingold Exploration et qui a été lancée par Paul Pedersen. Paul est relié à l'écosystème seulement en raison de ses contacts avec le ministère du Travail et de l'Éducation supérieure de la Nouvelle-Écosse (collecte de données de SMU) alors qu'il vivait et travaillait en Colombie-Britannique. Après avoir décroché son diplôme, Paul a créé quatre entreprises négociées sur le marché qui ont toutes été vendues dans le cadre de prises de contrôle inversées, ce qui a fait le bonheur de tous les investisseurs. Le bonheur des investisseurs facilite généralement l'obtention de fonds pour les initiatives suivantes. Paul a transféré à l'industrie du cannabis ses connaissances sur les processus d'extraction pour les petits producteurs de l'industrie minière. Il est maintenant le seul titulaire d'un brevet d'extraction dans l'industrie du cannabis aux États-Unis. Paul a récemment fait l'acquisition d'une usine de fabrication de produits pharmaceutiques de Cap-Breton qui avait été mise aux boules à mites et qui sera reconfigurée pour extraire l'huile du cannabis de bas grade. Il s'agit d'un formidable exemple de pont entre les domaines de connaissances : de l'industrie minière au cannabis, de la Colombie-Britannique à la Nouvelle-Écosse, du minerai de faible qualité au cannabis de faible qualité.

Des contacts multiples ou de plus en plus fréquents entre les acteurs pendant une certaine période stimulent l'établissement de liens durables [28]. S'ils s'appuient de plus en plus sur des sources d'information qui étaient jadis des liens faibles, les participants de l'écosystème finissent par établir des liens durables et à s'appuyer de plus en plus les uns sur les autres.

7. PARTICIPATION DES ENTREPRISES MATURES : NE COÛTE RIEN AUX ENTREPRISES MATURES MAIS N'A PAS DE PRIX POUR LES ENTREPRENEURS

Un examen d'un sous-groupe d'entreprises innovantes montre qu'il y a peu d'interaction entre les entreprises innovantes et les entreprises matures de l'écosystème. L'écosystème a besoin de leadership pour encourager la participation des entreprises matures. Le premier rôle des entreprises matures d'un écosystème entrepreneurial ou d'un pôle d'innovation est souvent l'achat de produits auprès des jeunes entreprises ou la vente de produits à celles-ci. Cela survient rarement, puisque les jeunes entreprises ont de la difficulté à atteindre le niveau de commercialisation nécessaire pour atteindre l'échelle de production et respecter les normes des processus d'achat et de vente requises par les entreprises matures.

Les grandes entreprises ou les entreprises matures ont joué un rôle important dans d'autres écosystèmes performants, notamment à Israël, dans la Silicon Valley et à Sophia Antipolis. Les entreprises

matures, sans nécessairement être de grandes entreprises, sont sûres et bien établies, et font du commerce à proximité géographique de l'écosystème. Sciemment ou sans le savoir, les entreprises matures contribuent aux réseaux entrepreneuriaux parce qu'elles catalysent la mobilité des ressources, créent leurs propres sociétés détachées, accélèrent la mise à l'essai et le développement des processus de commercialisation, cultivent des pratiques commerciales et un savoir-faire en démarrage d'entreprise chez les pré-fondateurs (leurs employés) et offrent du soutien par l'entremise de capitaux.

Les entreprises matures catalysent la mobilité des ressources, particulièrement des ressources humaines. Les entreprises matures favorisent le déplacement fréquent des ressources humaines dans l'écosystème, ce qui enrichit la collaboration. Le mélange et le recyclage des talents parmi les entreprises matures et les jeunes entreprises génèrent un roulement du savoir qui profite aux deux parties.

Les nombreuses compétences qui sont diffusées au sein d'un écosystème sont rehaussées grâce à la présence d'entreprises matures. Les entreprises matures développent des compétences chez leurs employés, ce qui les encourage à devenir des pré-fondateurs. Elles cultivent des connaissances approfondies dans des domaines précis, et les pré-fondateurs acquièrent ces connaissances pendant leur carrière à titre d'employés. Les écosystèmes performants tolèrent, voire encouragent, le recyclage rapide des talents et le déplacement des ressources humaines entre les entreprises, qu'elles soient grandes ou petites. Cette mobilité du capital humain facilite le transfert de savoir implicite, la collaboration intellectuelle et la validation et la réussite rapides ou, tout aussi important, l'échec rapide.

Fait saillant sur le marketing et la distribution

Pour appuyer cette constatation, des cartes à emporter ont été créées pour le sommet de l'Atlantique de la National Angel Capital Organization tenu en juin 2018, pour le discours du président de l'Université Saint Mary's portant sur l'entrepreneuriat présenté à la Chambre de commerce d'Halifax et pour la séance d'engagement communautaire tenue à Charlottetown en juin 2018 par l'Université de l'Île-du-Prince-Édouard. Ces cartes mentionnaient des méthodes auxquelles les entreprises matures peuvent avoir recours pour aider les entreprises innovantes.

Fait saillant sur le marketing et la distribution

Cette constatation a amené Mme Farrell à rédiger le rapport de recherche *Weak Ties and Global Reach: Network Theory and the Atlantic Entrepreneurial Ecosystem*, qui a été présenté à l'occasion de la septième International Research Meeting in Business and Management parrainée par l'École de gestion Telfer (Université d'Ottawa), le Groupe ESC Troyes en Champagne, l'IPAG – École de commerce et l'Université Nice Sophia Antipolis. Cet article est accessible dans la section ARTICLES ET RAPPORTS. Les travaux de Granovetter et Burt et Engels ont joué un rôle essentiel pour unir les constatations susmentionnées.

Les entreprises matures aident les entreprises en démarrage à adapter leur modèle d'affaires, à mettre à l'essai leur technologie et à élaborer ou améliorer leurs pratiques de gestion. Des encouragements modestes de la part d'entreprises matures peuvent offrir des possibilités exceptionnelles aux fondateurs émergents, et les entreprises qui en sont à leurs tout débuts tirent avantage à tisser des liens étroits avec les entreprises matures performantes et à obtenir du mentorat de leur part. Pendant les premières phases du développement d'entreprise, beaucoup d'équipes spéciales de nouveau produit se concentrent sur le produit plutôt que sur l'entreprise et le modèle d'affaires. La mise à l'essai et la validation rapides favorisent le processus d'apprentissage par lequel l'entrepreneur développe, pivote et recommence [29], ce qui permet à l'entrepreneur de comprendre plus rapidement ce que sont la réussite ou l'échec en ce qui a trait au modèle d'affaires et, par le fait même, accélère la démarche vers la commercialisation. Les entreprises matures et bien établies peuvent accélérer les processus de validation des entreprises en démarrage en mettant à l'essai les prototypes, en accordant l'accès à des ressources, en embauchant (ou en congédiant) des talents, en prescrivant la logistique nécessaire pour vendre sur des marchés donnés, en cultivant l'élaboration de procédures de contrôle des documents dans les grandes entreprises, en procédant à des évaluations et en fournissant des idées.

Certaines entreprises matures peuvent être en mesure d'émuler des clients pour les entreprises en démarrage de la région, ce qui contribue à diminuer le délai avant l'obtention d'une correspondance produit-marché. La correspondance produit-marché est le plus important obstacle à surmonter, puisque les jeunes technologies ont de la difficulté à répondre aux besoins des clients à l'aide des caractéristiques du produit. Il ne suffit pas que le produit fonctionne, il doit aussi répondre aux besoins du marché, des clients. Il s'agit souvent d'un défaut fatal pour des fondateurs qui autrement semblaient prometteurs. Même lorsque les entreprises matures de la région ne sont pas des clients viables, leur soutien peut reproduire les besoins d'une entreprise, contribuant ainsi à accélérer le développement des petites entreprises.

Fait saillant sur le marketing et la distribution

Ces constatations ont hâté la rédaction de l'article *The Role of Mature Firms in an Entrepreneurial Ecosystem*, qui a été présenté en tout ou en partie à plusieurs occasions, notamment lors de la Research Expo de l'Université Saint Mary's tenue en 2017 et lors de la conférence de 2017 du University-Industry Innovation Network, au cours de laquelle il a été remarqué jusqu'en Australie, à Waterloo, à l'Université de Moncton et à l'Université d'Ottawa. Cet article allait plus loin que les constatations présentées ici et enquêtait sur toutes les méthodes que les entreprises matures peuvent employer pour aider les entreprises en démarrage.

Les entreprises novatrices à croissance rapide peuvent améliorer la culture et le stock d'innovation des entreprises matures. Le fait d'avoir un aperçu de la propriété intellectuelle des entreprises en démarrage peut susciter l'intérêt des entreprises matures à l'endroit des fondateurs. Une jeune entreprise peut enclencher un processus d'innovation pour une entreprise mature dans les cas suivants : une entreprise mature investit dans une jeune entreprise pour être la première à obtenir un aperçu des développements touchant la technologie ou la discipline, l'entreprise mature achète une jeune entreprise pour grossir son stock d'innovation, ou l'entreprise mature achète une jeune entreprise pour saisir son innovation ou pour acquérir le talent ou la capacité intellectuelle des fondateurs et employés (ce qu'on appelle l'acqui-embauche).

Fait saillant sur le marketing et la distribution

Un ancien résidant de la région a accéléré les démarches de consultation d'une entreprise mature. Agissant comme intermédiaire, l'agent de liaison entre l'entreprise mature, les universités et les investisseurs providentiels a discuté de stratégies pour appuyer les jeunes technologies. Les rencontres suivantes ont amené l'entreprise à investir plus rapidement dans une entreprise en démarrage locale, TruLeaf en Nouvelle-Écosse, et lui ont permis de rencontrer plusieurs entreprises en démarrage performantes du domaine de la technologie installées dans la région.

Les entreprises matures peuvent éventuellement mettre en place des sociétés détachées qui créeront de nouvelles entreprises en démarrage. Lorsqu'il y a un grand nombre d'employés très bien informés sur l'industrie, la réserve de directeurs disponibles pour le démarrage d'entreprises et la création de nouvelles possibilités augmente [30]. Les emplacements ou les régions où se trouvent de nombreux intérêts industriels ou commerciaux (beaucoup de fournisseurs et d'employés ayant une connaissance pointue de l'industrie) ont tendance à présenter davantage de sociétés détachées créées par des employés qui quittent la société mère pour créer une nouvelle entreprise. Puisque les employés passent facilement des entreprises matures aux entreprises en démarrage, les relations entre les personnes et les entreprises s'intensifient, ce qui augmente les affinités pour la collaboration et l'établissement d'alliances et de partenariats.

Une dynamique « parentale » laisse entendre que les employeurs qui soutiennent les employés pré-fondateurs qui démissionnent contribuent davantage au rendement des entreprises en démarrage de leurs anciens employés (par rapport aux fondateurs qui quittent une entreprise mature sans encouragement ni soutien « parental ») [31].

Tableau 15 - Interventions éventuelles des entreprises matures pour appuyer les entreprises en démarrage et les fondateurs

1.	Effectuer de la R&D en présentant des problèmes devant être résolus par les entreprises innovantes par l'entremise d'invitations ouvertes à l'innovation, de concours ou de marathons de programmation.
2.	Mettre à l'essai des prototypes mis au point par des entreprises innovantes.
3.	Prêter des talents en génie ou d'autres ressources de nature opérationnelle ou de processus.
4.	Offrir du soutien administratif ou logistique, comme des salles de conférence, des bureaux, du matériel, des photocopieurs, des ressources en distribution.
5.	Mettre en place des politiques gouvernementales qui favorisent les contributions en nature de la part des entreprises matures.
6.	Prêter du matériel, des trousseaux ou des ressources qui sont difficiles à acquérir ou à acheter ou qui sont coûteux.
7.	Donner des fournitures de bureau, des meubles ou du vieux matériel aux accélérateurs, aux incubateurs ou aux entreprises en démarrage.
8.	En tant que sources d'emplois bien rémunérés et de stabilité, les entreprises matures peuvent libérer les employés qui pourraient devenir de nouveaux innovateurs et entrepreneurs sans que cela gêne leurs activités (Samsung, McCain, Emera, Louiburg Seafood).
9.	Accélérer la commercialisation des entreprises en démarrage en se procurant des produits ou services auprès d'elles ou en leur en vendant.
10.	Présenter des entreprises en démarrage au réseau d'une entreprise mature (fournisseurs, clients, concurrents, collègues).
11.	Offrir des présentations au réseau d'associés de l'industrie.
12.	Les dépenses ou le soutien du gouvernement destinés aux entreprises comportent des clauses conditionnelles pour aider la communauté des jeunes entreprises et des entreprises innovantes.
13.	Contribuer à la mise à l'essai rapide pour accélérer la validation.
14.	Participer à des essais auprès de la clientèle.
15.	Offrir des détails ou de la logistique pour aider les entreprises en démarrage à effectuer des essais sur le terrain.
16.	Aider les entreprises en démarrage à déterminer les principales qualités requises pour les situations critiques liées aux missions (p. ex. procédures de contrôle des documents, visites d'assurance préalables, consultations et exigences relatives au contrôle de la qualité).
17.	Inviter une entreprise en démarrage à assister à une conférence de l'industrie avec des employés d'une entreprise mature.
18.	Formuler des commentaires sur la correspondance produit-marché.
19.	Mettre à l'essai les prototypes pour les entreprises en démarrage et les cofondateurs.
20.	Agir comme un client afin que l'entreprise en démarrage puisse comprendre les bases du langage et des besoins des grandes entreprises ainsi que la façon de dialoguer avec elles.
21.	Faire voyager un entrepreneur dans le même avion que votre groupe des ventes ou que votre groupe technique. Le laisser tester le marché avec votre équipe ou écouter comment répondre aux préoccupations des clients.
22.	Organiser une rencontre entre une entreprise mature que vous connaissez et une entreprise en démarrage qui pourrait en tirer profit.

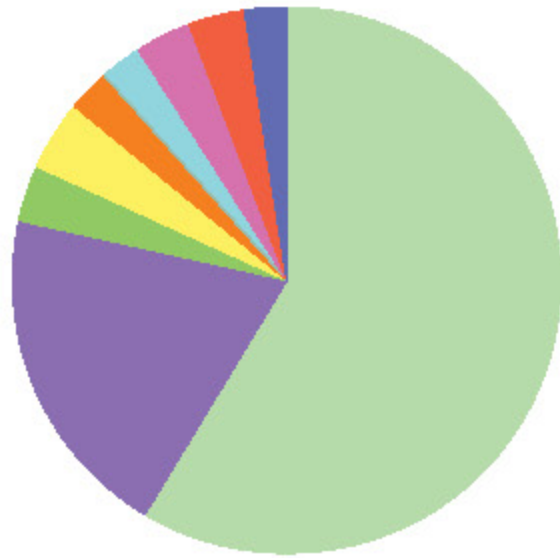
Source : Tableau créé par l'auteur

FIGURE 11 – PARTICIPATION DES ENTREPRISES MATURES À L'ÉCOSYSTÈME ENTREPRENEURIAL

770 nodes 102 edges

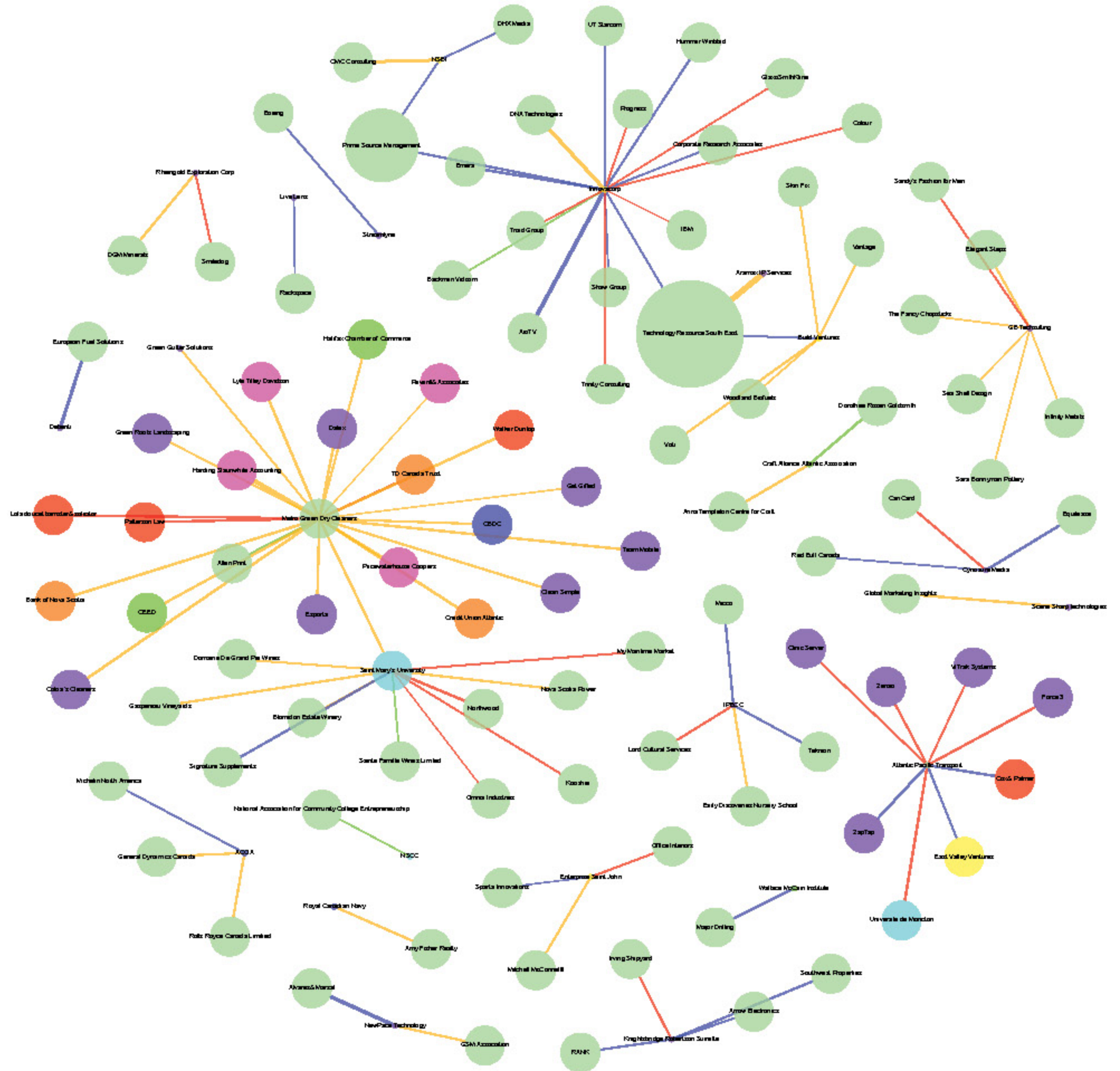
NODES

- 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



Les membres de l'écosystème doivent aider les entreprises matures à participer. À un moment au cours du présent projet, le ministre de l'Entreprise a demandé à l'auteure principale ce que les entreprises matures peuvent faire dans l'écosystème. Il souhaitait qu'une liste soit dressée. C'est ce qui a amené à la rédaction d'un important rapport de recherche sur le rôle des entreprises matures dans un écosystème et à l'établissement de la liste du tableau 15.

Les organisations de soutien, les chambres de commerce, les organismes de développement économique et les universités et collègues peuvent organiser des activités qui permettront aux entreprises matures d'entrer régulièrement en contact avec les fondateurs. Il pourrait s'agir de marathons de programmation, d'activités de réseautage pour certains types d'entreprises ou d'activités d'établissement de relations. Les participants à ces rencontres pourraient être de nombreuses grandes entreprises et une sélection de fondateurs, ou encore de nombreux fondateurs invités par une seule grande entreprise. (En ce qui concerne cette option, ces activités doivent être tenues par des hôtes ou des modérateurs compétents et offrir une programmation planifiée pour éviter le scénario suivant décrit à l'auteure. Tous les entrepreneurs étaient assis dans la salle, bras croisés, alors que la seule grande entreprise présente essayait d'exprimer son intérêt à appuyer la communauté des entreprises en démarrage et le fait qu'elle était « ouverte » à travailler avec elles. Cette réaction de fermeture des entrepreneurs est attribuable au fait qu'ils craignaient de se faire voler leur technologie et leurs idées, à de l'hypocrisie et à une vive inquiétude tout à fait justifiée.)

8. RECHERCHE DE CAPITAL RISQUE À L'EXTÉRIEUR DE LA RÉGION DE L'ATLANTIQUE

Dans l'analyse, la plupart des sociétés de capital risque représentées dans les graphes n'y apparaissent pas en raison des réponses des entrepreneurs, mais plutôt en raison des réponses des autres sociétés de capital risque. et non pas des fondateurs. Les fondateurs et leur entreprise devraient établir des contacts avec des sociétés de capital risque à l'extérieur de la région, voire avec des sociétés spécialisées dans leur domaine de technologie. Les co-fondateurs qui approchent des investisseurs à l'extérieur de la région profiteront a) d'un élargissement de leurs connaissances sur les spécialités financières (AgTech, écotechnologie, spécialistes des TIC, côte est vs côte ouest), b) d'une exposition à leur concurrence et c) contribueront à placer la région sur la carte mondiale de l'entrepreneuriat et de l'innovation.

Les options financières locales sont beaucoup plus généralisées que les spécialistes qu'on trouve partout ailleurs. Il y a peu de capital risque privé et indépendant au Canada atlantique et beaucoup des fonds locaux (pas tous) tentent de combler les lacunes financières et de remplir des mandats gouvernementaux ou quasi-

gouvernementaux. Le mandat de certains a été élargi pour offrir du soutien et du mentorat dans l'écosystème ainsi que des possibilités d'incubation. Dans un très petit marché, la spécialisation n'est pas viable.

Lorsque les fondateurs cultivent leurs capacités, leur modèle d'affaires, leur proposition de valeur et leur validation auprès de sociétés de capital risque à l'extérieur de la région, ils s'exposent à un public averti. Lorsqu'ils sont bombardés de questions par un groupe d'investisseurs qui ne sont pas dupes, les fondateurs aiguisent leurs capacités et doivent travailler dur pour élaborer une proposition de valeur qui surpasse celle de leurs concurrents ainsi que pour établir une correspondance produit-marché. Il y a une exception digne de mention dans les données; il s'agit d'une seule entreprise qui a passé énormément de temps à chercher du capital à l'extérieur de la région pendant quelques années. New Pace Technologies a fini par être achetée par Samsung, ce qui représente un retrait gagnant pour les entrepreneurs et justifie leur dur labeur.

Il ne revient pas aux entrepreneurs de faire de leur région un écosystème entrepreneurial mondial. Toutefois, plus ils établissent de contacts, plus leur travail appuie le reste du réseau.

9. AMÉLIORER L'ÉTABLISSEMENT DE RELATIONS ENTRE PAIRS (ET AVEC DES MENTORS)

Le rendement des nouvelles entreprises dépend des liens sociaux et des réseaux que les entrepreneurs tissent entre eux [32]. Une sous-section des données (Terre-Neuve-et-Labrador) a révélé qu'il y avait très peu de demandes d'information entre pairs et entre fondateurs. La grande majorité des contacts étaient établis avec des organisations de soutien ou des gouvernements, par exemple. À Terre-Neuve-et-Labrador, Blair Winsor et Ken Carter ont écrit que les entreprises innovantes de chaque région devraient envisager d'en faire plus entre elles pour améliorer leur écosystème; elles doivent communiquer et interagir davantage, et s'appuyer les unes sur les autres [22].

La littérature sur le mentorat fait une distinction entre les relations entre pairs et les relations entre pair et mentor. L'âge et l'expertise du mentor sont à la base de cette distinction. Les mentors sont généralement plus âgés et en sont à un stade plus avancé de leur carrière qu'un simple pair. Les pairs peuvent s'échanger implicitement des connaissances et parler de leur expérience de travail au sein d'une entreprise innovante (les règles non écrites, les attitudes, les valeurs, les comportements à adopter et les normes). Les solutions aux problèmes peuvent faire l'objet de discussions sans jugement.

À l'autre bout du spectre, les entrepreneurs performants peuvent être des mentors pour les entrepreneurs. Les mentors en entrepreneuriat performants possèdent une crédibilité et une influence sociale uniques découlant du fait qu'ils soient des entrepreneurs de haut statut. Leur capacité à présenter leur protégé à des financiers, à des cadres titulaires de ressources, à des employés potentiels ou à des cofondateurs augmente le prestige social du protégé par association. Un mentor performant aura plus d'influence lorsqu'il recommandera son protégé à des intermédiaires, puisque sa recommandation a plus de poids auprès d'un investisseur, par exemple, que celle d'une autre personne. Les mentors performants font souvent une présélection de leurs protégés potentiels pour s'assurer de travailler avec des talents d'exception auxquels il vaut la peine de consacrer du temps.

Des études sur des non-entrepreneurs qui sont exposés à l'influence sociale de mentors en entrepreneuriat révèlent une hausse de la prédilection pour les carrières en entrepreneuriat, particulièrement chez les personnes dont les parents ne sont pas issus du domaine entrepreneurial. Les possibilités incroyables offertes par Ventures for Canada sont fondées sur ce principe. Soyons clairs. Ces influences peuvent mener à une carrière au sein d'une entreprise innovante, comme un poste dans une entreprise innovante en démarrage, pas nécessairement à une carrière de fondateur ou de cofondateur.

10. PRATIQUES EXEMPLAIRES À ADOPTER POUR RÉALISER UNE RECHERCHE DE MÊME NATURE

Le processus de génération de réponses au sondage a été plus facile à certains endroits qu'à d'autres. De nombreux emplacements ont été choisis dans la région de l'Atlantique pour tirer parti des connaissances et des forces des universitaires de chaque emplacement. Dans certains cas, il y avait plusieurs personnes pour un secteur donné. Par exemple, l'Université Cape Breton comptait trois universitaires qui ont contribué d'un point de vue axé sur l'île. Cette méthode visait à exploiter le plus possible le prestige du nom de l'universitaire. Les universitaires distribuaient les sondages dans la communauté entrepreneuriale à partir de leur adresse électronique de l'université, profitant ainsi du respect dont ils jouissent dans la communauté.

La distribution du sondage a été effectuée à différentes occasions et il est apparu qu'il était plus productif d'avoir recours aux centres d'entrepreneuriat et de développement des entreprises pour établir des populations et des échantillons. Les centres d'entrepreneuriat et de développement des entreprises entretiennent d'étroites relations de travail avec leurs clients. Dans de nombreux cas, il en a résulté des bases de données comptant des milliers de clients du domaine de l'entrepreneuriat avec lesquels ils ont travaillé au fil des ans et entretiennent encore des liens.

Si le présent travail est reproduit à l'avenir, on recommande vivement de cultiver des relations de recherche avec les centres d'entrepreneuriat régionaux (p. ex. Institut McCain, Entrepreneurship Centre de l'Université Saint Mary's, Centre Genesis), puisqu'il s'agit d'une méthode plus productive pour établir des populations et des échantillons et pour distribuer les sondages.

Fait saillant sur le marketing et la distribution

Les centres d'entrepreneuriat sont de bons partenaires de recherche pour ce type de travail. Cette conclusion a fait l'objet d'une présentation offerte à un grand groupe de centres d'entrepreneuriat provenant de partout sur la planète. La Global Conference of Entrepreneurship Centres a été tenue par l'Université Saint Mary's et l'Université Dalhousie en 2017, et les centres d'entrepreneuriat étaient d'avis qu'il était très intéressant d'avoir l'occasion de participer à un projet de recherche aussi passionnant.

QUESTIONS SOULEVÉES PAR LA DE RECHERCHE

Le présent travail élargit la gamme des connaissances et des outils disponibles pour étudier la curiosité des entrepreneurs à l'égard de l'innovation et applique la méthodologie quantitative de la théorie des réseaux aux comportements de quête d'information des entrepreneurs. Des données et une analyse de qualité permettent de tirer des conclusions intéressantes qui mènent à de nouvelles questions de recherche. Vous trouverez ci-dessous des questions soulevées par les conclusions du projet d'écosystème entrepreneurial de l'Atlantique.

PAS « QUI A ÉTÉ SOLlicitÉ? », MAIS PLUTÔT « QUI A DEMANDÉ DE L'INFORMATION NOVATRICE? »

L'enquête a répondu aux questions suivantes : Qui a été sollicité par les membres de l'écosystème pour obtenir de l'information? Qui sont les participants de l'écosystème qui ont établi des contacts pour satisfaire leur curiosité? Après avoir révisé toutes les réponses des répondants pour découvrir le degré sortant, on a pu établir des graphes qui nous montrent qui établit le plus de contacts au nom de son entreprise. Si on retourne la question pour savoir « qui dans l'écosystème a fait le plus de recherche pour obtenir la meilleure information, l'information la plus éloignée, la plus novatrice, etc. », il faudrait obtenir la participation de représentants de gouvernements, d'organismes de soutien, d'entreprises professionnelles et de financiers, notamment, ce qui est plus difficile en raison des questions de confidentialité lorsque les réponses pourraient concerner des clients.

LE LIEN ENTRE L'IMPORTANCE DE L'INFORMATION ET LA FRÉQUENCE À LAQUELLE ELLE A ÉTÉ SOLlicitÉE

Il semblerait probable qu'il y ait un certain lien entre la fréquence à laquelle l'information est sollicitée et l'importance ou la valeur de l'information pour le demandeur; une corrélation positive. Ou peut-être y a-t-il un lien indirect, et un rapport importance-fréquence pourrait devenir un indice d'efficacité des activités de quête d'information – obtenir de l'information très utile par l'entremise d'un petit nombre de demandes. Toutes les données recueillies par les chercheurs de cette étude sont accessibles à ces chercheurs. Différents chercheurs ont réalisé de nombreuses analyses sur des sous-groupes de données, produisant de nouvelles méthodes à envisager pour répondre aux questions. Ces analyses

pourraient être réalisées sur d'autres sous-groupes de données par des chercheurs collaborateurs, qui pourraient aussi explorer les données sur la fréquence qui ont été recueillies.

LES RÉSEAUX D'EGO SOULIGNENT LA COMMUNAUTÉ DE NŒUDS ASSOCIÉE À UN ACTEUR

Un réseau d'ego est un réseau de nœuds associé à un nœud donné, peu importe la voie. De nombreux egos intéressants sont possibles dans un projet de recherche comme celui-ci. Qu'en est-il d'une université donnée? Ou d'un organisme gouvernemental donné? Qu'en est-il d'un fonds de capital risque en particulier? Quels types d'information émanent de ces nœuds, y proviennent et gravitent autour, et avec qui sont-ils en contact? De plus, on peut faire des observations au sujet des grandes différences entre les réseaux d'ego des entrepreneurs immigrants et non immigrants. Ou au sujet du réseau d'ego des femmes par rapport à celui des hommes. Ou des gens de Terre-Neuve-et-Labrador par rapport à ceux de l'Île-du-Prince-Édouard.

CONTACTS DES ACTEURS À L'ÉCHELLE NATIONALE ET INTERNATIONALE

Dans les deux sous-ensembles de données de ce travail, une analyse plus pointue a été réalisée pour confirmer l'emplacement géographique des répondants et de leurs homologues. L'analyse a permis d'évaluer la portée des répondants à un niveau tel qu'il a été possible de tirer des conclusions intéressantes sur la centralité de l'écosystème entrepreneurial de l'Atlantique. Un travail de cette nature sur les autres sous-ensembles de données produirait-il pareilles conclusions?

FRONTIÈRE FLOUE ENTRE LES ENTREPRENEURS EN TECHNOLOGIE ET LES ENTREPRENEURS « TRADITIONNELS »

On discute parfois de la différence entre l'entrepreneuriat en technologie et l'entrepreneuriat traditionnel, mais ce sujet est peu abordé dans la littérature universitaire. Fait intéressant, ce qui est abordé est probablement contraire à l'opinion populaire.

Dans les discussions plus poussées sur l'économie, on dit que les buts des entrepreneurs en technologie consistent à

créer de la valeur et à l'augmenter par l'entremise de l'innovation, puis à obtenir un rendement en vendant leurs capitaux propres et leurs parts et en engrangeant des investissements [33], et non en faisant du profit. Les entreprises traditionnelles performantes, pour leur part, favorisent la création d'entreprises à croissance rapide, ce qui crée des emplois et contribue aux initiatives politiques de nombreux gouvernements. Les entrepreneurs traditionnels développent leurs activités et cherchent à gagner en efficacité, maximisant ainsi leurs profits pour récolter des dividendes.

La différence entre les deux est soulignée lorsque les entreprises en technologie (qui génèrent peu ou pas de revenus, de profits et d'emplois) obtiennent un rendement en vendant leurs innovations et leurs capitaux propres (ou l'ensemble de l'entreprise dans le cadre d'une prise de contrôle) pour faire des gains en capital. Pour leur part, les entreprises traditionnelles se développent, embauchent des employés, cherchent de nouveaux clients, travaillent dans leur collectivité et avec d'autres intervenants pour assurer leur rentabilité et déclarent des dividendes à leurs actionnaires. Ces descriptions vont à l'encontre de ce qu'on dit habituellement sur l'écosystème.

Selon ces définitions, l'entreprise traditionnelle semble très satisfaisante pour un décideur. (Les entreprises traditionnelles non productives sont les entreprises dites de type « lifestyle ». Elles créent un emploi et un revenu pour leur propriétaire principalement et présentent peu d'autres résultats économiques [34]. On les confond souvent avec les entreprises traditionnelles performantes.)

Pour rendre cette question d'autant plus complexe, l'avancée de la TI dans presque toutes les entreprises brouille encore davantage la frontière entre les entrepreneurs traditionnels performants et les entrepreneurs en technologie. L'intégration de l'innovation technologique et de la TI à l'environnement social et économique stimule la capacité des entrepreneurs traditionnels à atteindre des marchés, à établir des contacts avec des fournisseurs, à connaître leurs concurrents et à servir leurs employés. L'utilisation de la TI, des réseaux sociaux et virtuels et des technologies commercialisées permet aux entreprises traditionnelles de bénéficier de meilleures possibilités de co-création de valeur avec leurs parties prenantes [35], ce qui brouille la frontière entre l'entrepreneuriat traditionnel et technologique. Il devient donc de plus en plus difficile de voir la différence entre les deux groupes.

À une conférence, l'auteure a questionné Gerry Pond à ce sujet, qui a répondu qu'aujourd'hui, tout le monde est un entrepreneur en technologie. Selon lui, si on utilise un ordinateur, on travaille

en technologie. Si un entrepreneur vend en ligne ou rencontre des clients sur Google Hangouts, est-il un entrepreneur en technologie? Lorsque le propriétaire d'un restaurant souhaite améliorer sa productivité avec du nouveau matériel, ou améliorer ses ventes en lançant une nouvelle campagne sur les médias sociaux, ou offrir la livraison sur SkiptheDishes, ou améliorer sa productivité en louant un véhicule doté de robots qui montent, cuisent, coupent et emballent les pizzas pendant le trajet vers le domicile du client (oui, c'est maintenant possible grâce à Zume, une entreprise de pizza fondée à Silicon Valley), crée-t-il de nouveaux modèles d'affaires à l'aide de la technologie?

REPÉRAGE DES SOURCES D'INFORMATION FAIBLES ET FORTES

Dans cette étude, les comportements de quête de savoir s'entendaient d'actions menées au téléphone, en personne ou par courriel ou message texte par un élément de l'écosystème dans le but d'entrer en contact avec une autre personne eu vue de trouver de l'information pour prendre une décision touchant une entreprise innovante. La source de l'information obtenue était identifiée par son nom et par son organisation. Il serait utile de vérifier si chaque communication énumérée était faible ou forte, si la personne sollicitée était une relation connue ou une source d'information relativement distante. Cette information serait un complément utile à la recherche et servirait à relever les quêtes d'information indiquées comme étant les plus utiles lorsqu'elles dérivent de liens faibles. Peut-être serait-ce possible en procédant à une enquête sur un réseau d'ego à plus petite échelle.

ÉCHANTILLONNAGE NON PROBABILISTE POUR TOUT L'ENSEMBLE DE DONNÉES

Un sous-ensemble de données a fait l'objet d'une analyse approfondie. Pour ce faire, on a demandé aux sources d'information des répondants de répondre également au sondage. Il a fallu recenser toutes les sources d'information énumérées par les répondants, les trouver et obtenir leur adresse électronique. Pour l'échantillon concerné, cette tâche a pris beaucoup de temps. On visait par ce travail à élargir la portée de l'écosystème. Si on poursuivait, on pourrait élargir la portée des données actuelles.

LES FONDATEURS EN MILIEU RURAL EMPLOIENT-ILS D'AUTRES STRATÉGIES POUR LEURS ACTIVITÉS DE QUÊTE D'INFORMATION?

Y a-t-il une différence dans la façon dont les entrepreneurs ruraux satisfont leur curiosité pour faire progresser les capacités de leur entreprise? En Nouvelle-Écosse, un peu moins de la moitié de la population vit dans la municipalité régionale d'Halifax, et le Grand St. John's compte environ 35 % de la population de

Terre-Neuve-et-Labrador. L'activité entrepreneuriale est-elle stimulée par la densité de chocs des régions urbaines [36] que les collectivités rurales envient tant, et que font ces dernières pour en contrebalancer les effets? L'augmentation du taux d'interaction entre les entrepreneurs favorise l'intérêt, la mobilité des talents, la créativité et les possibilités chez les cofondateurs et les jeunes entreprises. La mesure dans laquelle la densité de chocs et la quête

d'information sont liées est inconnue. De plus, il ne fait aucun doute que les préoccupations liées à l'absence d'accès Internet dans certaines régions rurales seraient influencées par cet aspect. Enfin, certaines régions rurales comptent une grande entreprise qui constitue leur noyau, et nous avons vu le rôle que les entreprises matures peuvent jouer pour appuyer et encourager les fondateurs.

ACTIVITÉS DE MARKETING ET DIFFUSION

Les activités de marketing et la diffusion du projet de recherche étaient prioritaires pour contribuer à établir les points de vue de personnes liées entre elles dans l'écosystème. Il y a eu plus de 40 séances d'engagement que nous avons tenues ou auxquelles nous avons participé (sans parler des visites à des organisations privées) pendant toute la durée du projet.

Environ 960 personnes ont été exposées à la recherche pendant son élaboration, et ce nombre ne comprend pas les gens qui pourraient avoir entendu parler du projet dans les médias ni les personnes qui ont reçu le sondage. Les diverses activités de diffusion ont permis d'ajouter à la recherche des commentaires et questions pertinents formulés par les participants. La diffusion du savoir a orienté l'étude pendant son déroulement; il s'agit d'une approche constructiviste.

Les activités de marketing et de diffusion ont pris diverses formes : invitations à des allocutions, présentations lors de conférences, expositions de recherche pour des universitaires et des praticiens,

rencontres avec des éléments de l'écosystème, entrevues dans les journaux et à la radio, lancement d'autres projets de même nature (MaRS Discovery District), thèses d'étudiants sur l'innovation et soumission de propositions de recherche. Ces nombreuses activités de diffusion et de dialogue menées pendant la période de recherche ont permis d'obtenir des observations auprès des milliers de personnes qui ont vu la base de données pendant son élaboration. Comme cela arrive souvent lorsqu'on adopte une approche constructiviste, ces commentaires ont contribué à façonner le raisonnement sur les écosystèmes en général, et sur l'écosystème entrepreneurial de l'Atlantique en particulier.

Vous trouverez ci-dessous une liste des activités de marketing et de diffusion (mobilisation du savoir en langage universitaire), en ordre chronologique.

Tableau 16 - Activités de marketing et diffusion (mobilisation du savoir) entre 2015 et 2018

N°	Type de projet	Titre et description du projet	Organisateur/université	Lieu	Date
1	Création de savoir	<i>Measuring and Mapping Entrepreneurial Ecosystem's Innovation Activities</i> , E. Farrell et N. Dennison	Sobey School of Business : série de documents de travail	Halifax, Nouvelle-Écosse	Juin 2015
2	Présentation de la recherche	Schématisation et mesure du comportement de quête d'information dans un écosystème entrepreneurial	Financing Technology Université de Bologne	Rimini, Italie	Juin 2015
3	Création de savoir	<i>Opportunities for Syndication in a Government VC Dominated Entrepreneurial Ecosystem</i> , par E. Farrell	Sobey School of Business : série de documents de travail	Halifax, Nouvelle-Écosse	Juin 2015
4	Présentation de la recherche	Possibilités de syndication dans un écosystème entrepreneurial dominé par les capitaux de risque gouvernementaux, E. Farrell	Business and Economics Society International Conference	Faro, Portugal	Juillet 2015
5	Création de savoir	<i>Quantitative Analysis of the Atlantic Entrepreneurial Ecosystem's Innovation Activities</i> E. Farrell et N. Dennison	Sobey School of Business : série de documents de travail	Halifax, Nouvelle-Écosse	Mai 2015

6	Présentation de la recherche	Analyse quantitative des activités d'innovation de l'écosystème entrepreneurial de l'Atlantique E. Farrell	Academy for Innovation and Entrepreneurship; National Research Center of Entrepreneurship, Université Tsinghua, Chine; Technology and Management Centre for Development, Université d'Oxford, Royaume-Uni; Canada-China Institute for Business and Development, Université Ryerson, Canada	Toronto, Ontario	20 et 21 août 2015
7	Atelier politique	L'écosystème entrepreneurial de l'Atlantique : un atelier politique pour bâtir l'économie entrepreneuriale de notre région	Université Saint Mary's	Halifax, Nouvelle-Écosse	17 et 18 septembre 2015
8	Présentation de la recherche	Research EXPO	Université Saint Mary's	Halifax, Nouvelle-Écosse	22 mars 2016
9	Tenue d'une conférence	Entrepreneuriat et innovation : libérer le potentiel régional : encourager la collaboration entre les universités, les gouvernements, les collectivités et les entreprises pour renforcer l'écosystème entrepreneurial de la région	L'EEA a incité l'Office of Engagement du campus Grenfell à tenir une conférence pour discuter de l'innovation et de l'entrepreneuriat à Terre-Neuve.	Corner Brook, Terre-Neuve-et-Labrador	7 et 8 avril 2016
10	Invitation à prononcer une allocution	Étude sur l'EEA et valeur des écosystèmes entrepreneuriaux, E. Farrell, B. Winsor et K. Carter	Entrepreneuriat et innovation : libérer le potentiel régional : encourager la collaboration entre les universités, les gouvernements, les collectivités et les entreprises pour renforcer l'écosystème entrepreneurial de la région	Campus Grenfell de Corner Brook, Terre-Neuve-et-Labrador	7 et 8 avril 2016
11	Publicité	Une équipe de recherche de l'Université Cape Breton tente d'aider les entrepreneurs de Cap-Breton à mieux réussir.	Cape Breton Post	Cap-Breton, Nouvelle-Écosse	10 juillet 2016
12	Création de savoir	<i>Weak Ties and Global Reach: Network Theory and the AEE</i> , par E. Farrell	Sobey School of Business : série de documents de travail	Halifax, Nouvelle-Écosse	Mai-juin 2017

13	Présentation de la recherche	Liens faibles et portée mondiale : théorie des réseaux et écosystème entrepreneurial de l'Atlantique, conférencière invitée	Septième International Research Meeting in Business and Management (IRMBAM). École de gestion Telfer - Université d'Ottawa, Groupe ESC Troyes en Champagne, IPAG - École de commerce, Université Nice Sophia Antipolis.	Nice, France	11 et 12 juillet 2016
14	Autre	Rencontre et visite de l'écosystème de Sophia Antipolis, en France	Avec Christian Longhi, Ph. D., chercheur universitaire au GREDEG, France	Sophia Antipolis, France	12 juillet 2016
15	Invitation à prononcer une allocution	Sommet de 2016 de la National Angel Capital Organization, conférencière invitée, projet sur l'écosystème entrepreneurial de l'Atlantique	National Angel Capital Organization (NACO)	Vancouver, Canada	Du 4 au 6 octobre 2016
16	Invitation à prononcer une allocution	Rencontre annuelle des doyens et directeurs de la FCDEA	Fédération canadienne des doyens des écoles d'administration (FCDEA), Université Saint Mary's	Halifax, Nouvelle-Écosse	23 et 24 octobre 2016
17	Autre	Consultation au siège social de McCain	McCain Foods, Ellen Farrell, Mike Durland, Gerry Pond, Jeff Delapp - président de McCain Foods en Amérique du Nord, Barry Murchie - vice-président des opérations commerciales à McCain Foods USA	Halifax, Chicago, Toronto	Janvier 2017
18	Présentation de la recherche	Research EXPO	Université Saint Mary's	Halifax, Nouvelle-Écosse	3 mars 2017
19	Atelier	Atelier de recherche sur la théorie des réseaux. Participation de trois étudiants de cycle supérieur et de cinq facultés.	Retraite de recherche, campus Grenfell, Université Memorial	Corner Brook, Terre-Neuve-et-Labrador	18 et 19 avril 2017

20	Engagement communautaire	Résultats de Corner Brook et St. John's : théorie des réseaux et écosystème entrepreneurial de l'Atlantique	Université Memorial, Navigate Entrepreneurship Centre (Go Engagement)	Corner Brook, Terre-Neuve-et-Labrador	20 avril 2017
21	Invitation à prononcer une allocution	Leadership audacieux : renforcer les collectivités canadiennes	Smith School of Business, Université Queen's	Île Fogo, Terre-Neuve-et-Labrador	Du 11 au 14 mai 2017
22	Création de savoir	<i>The Role of Mature Firms in an Entrepreneurial Ecosystem</i> , par E. Farrell	Sobey School of Business : série de documents de travail	Halifax, Nouvelle-Écosse	Janvier-février 2017
23	Présentation de la recherche	Le rôle des entreprises matures dans un écosystème entrepreneurial. Conférence du University-Industry Interaction Network	University-Industry Innovation Network (UIIN), Trinity College	Dublin, Irlande	Du 7 au 9 juin 2017
24	Engagement communautaire	Résultats de Cap-Breton : théorie des réseaux et écosystème entrepreneurial de l'Atlantique. E. Farrell, D. Brown, K. Carter, K. McKeague	Community Innovation & Social Enterprise Conference, Shannon School of Business, Université Cape Breton	Sydney, Nouvelle-Écosse	Du 12 au 14 juillet 2017
25	Autre	Nomination au Prix d'enseignement distingué de l'Association des universités de l'Atlantique - Ellen Farrell, Ph. D.	Association des universités de l'Atlantique, Département de gestion, Sobey School of Business, Université Saint Mary's	Halifax, Nouvelle-Écosse	2017

26	Présentation de la recherche	Schématisation de l'écosystème entrepreneurial : avantages pour les centres d'entrepreneuriat, visualisation d'un écosystème entrepreneurial	Conférence internationale du GCEC, Université Dalhousie, Université Saint Mary's, Université du Nouveau-Brunswick	Halifax, Nouvelle-Écosse	Du 12 au 14 octobre 2017
27	Autre	Blitz de données	L'Université Cape Breton rencontre le public pour élargir l'échantillon de recherche.	Sydney, Nouvelle-Écosse	26 octobre 2017
28	Publicité	Les entrepreneurs de Cap-Breton sont interrogés sur les mesures de soutien et les services.	Cape Breton Post	Nouvelle-Écosse	24 octobre 2017
29	Proposition de recherche	Appel d'articles - La dynamique des écosystèmes entrepreneuriaux. David Audretsch, Colin Mason, Morgan P. Miles et Allan O'Connor	Entrepreneurship & Regional Development. An International Journal.		9 mars 2018
30	Présentation de la recherche	Schématisation de la quête d'information dans les écosystèmes entrepreneuriaux de St. John's et de Corner Brook	Fonds de recherche appliquée du Harris Centre	St. John's, Corner Brook	31 mars 2018
31	Autre	La MRSA a joué un rôle de premier plan en encourageant le MaRS District à entreprendre un projet semblable.	MaRS Discovery District	Ontario, Canada	18 mois, 2017-2018
32	Autre	Atelier de rédaction du rapport de recherche	Conseil canadien pour les PME et l'entrepreneuriat, N. Dennison	Halifax, Nouvelle-Écosse	Du 3 au 5 mai 2018
33	Invitation à prononcer une allocution	Bâtir un écosystème régional concurrentiel à l'international. Sommet de 2018 dans la région de l'Atlantique de la NACO.	National Angel Capital Organization (NACO)	Halifax, Nouvelle-Écosse	28 et 29 mai 2018
34	Autre	Collaboration avec l'Institut Wallace McCain pour la distribution du sondage au Nouveau-Brunswick et au Canada atlantique.	Institut Wallace McCain Nancy Mathis, directrice générale	Fredericton, Nouveau-Brunswick	Avril-mai 2018

35	Proposition de recherche	Conférence 2018 de recherche en entrepreneuriat du Babson College	Waterford Institute of Technology, School of Business, Centre for Enterprise Development & Regional Economy et Irish Network for Teachers and Researchers in Entrepreneurship (infructueux)	Waterford, Irlande	Du 6 au 9 juin 2018
36	Autre	Comment les entreprises matures peuvent appuyer les entreprises en démarrage : création de cartes	Utilisées à la séance d'engagement communautaire de l'UPEI	Charlottetown, Île-du-Prince-Édouard	11 juin 2018
37	Engagement communautaire	Activité d'engagement communautaire en 2018 à l'Île-du-Prince-Édouard. Organisée par S. Graham, Ellen Farrell et Nathan Dennison.	UPEI	Charlottetown, Île-du-Prince-Édouard	11 juin 2018
38	Autre	Thèse de doctorat : Ellen Farrell, lectrice pour un étudiant au doctorat; Claudia De Fuentes, superviseure; Ryan Gibson, lecteur; Roland Martin, examinateur externe. Thèse sur les innovations privées et publiques grâce à la théorie des réseaux.	Université Saint Mary's	Halifax, Nouvelle-Écosse	2016-2018
39	Présentation de la recherche	Schématisme de la quête d'information dans les écosystèmes entrepreneuriaux de St. John's et de Corner Brook : conclusions préliminaires	People, Place and Public Engagement Conference, Université Memorial, K. Carter et B. Winsor	St. John's, Terre-Neuve-et-Labrador	Du 25 au 27 octobre 2018
40	Atelier de recherche	BNUZ-SMU Research and Academic Skill Building Symposium	Université normale de Pékin et Université Saint Mary's	Zhuhai, Chine	16 et 17 novembre 2018
41	Engagement communautaire	Engagement communautaire au Nouveau-Brunswick : conclusions préliminaires de l'EEA	Dannie Brown, Ph. D., doyen, Université Crandall et Izold Guihur, Ph. D., Université de Moncton	Moncton, Nouveau-Brunswick	Le 12 octobre 2018

42	Présentation à une conférence	Conclusions préliminaires de l'EEA : K. McKague, E. Farrell et N. Dennison	Conférence 2018 de l'Atlantic Schools of Business : Université de Moncton	Moncton, Nouveau-Brunswick	Du 28 au 30 septembre 2018
43	Invitation à prononcer une allocution	Innovation Fête : parrainé par le gouvernement de la Nouvelle-Écosse, N. Dennison	NSSC, campus Burridge	Yarmouth, Nouvelle-Écosse	23 octobre 2018
44	Création de savoir	<i>First glance at an innovative ecosystem to build entrepreneurial intellectual capital</i>	Résumé soumis à la dixième European Conference on Intangibles and Intellectual Capital, I. Guihur, E. Farrell, N. Dennison	Moncton, Nouveau-Brunswick	Octobre 2018



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, Sobeys 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, Sobeys 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: _____ Age: 18-25 36-45 66+
 26-35 46-65
 Prefer not to answer

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

Level of Education (select all appropriate):

- | | |
|---|---|
| <input type="checkbox"/> High school or equivalent | <input type="checkbox"/> Master's degree |
| <input type="checkbox"/> Vocational/technical school (2 year) | <input type="checkbox"/> Doctoral degree |
| <input type="checkbox"/> Some college | <input type="checkbox"/> Professional degree (MD, JD, etc.) |
| <input type="checkbox"/> Bachelor's degree | <input type="checkbox"/> Other (please specify): _____ |

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

- | | |
|---|--|
| <input type="checkbox"/> Entrepreneur | <input type="checkbox"/> Consultant |
| <input type="checkbox"/> Social entrepreneur | <input type="checkbox"/> Journalist |
| <input type="checkbox"/> Venture capitalist | <input type="checkbox"/> Professor |
| <input type="checkbox"/> Private individual investor | <input type="checkbox"/> Employee in a mature company |
| <input type="checkbox"/> Member of a business angel network | <input type="checkbox"/> Research laboratory employee |
| <input type="checkbox"/> Lawyer | <input type="checkbox"/> Banker |
| <input type="checkbox"/> Accountant | <input type="checkbox"/> Other (please specify): _____ |
| <input type="checkbox"/> Government representative | |

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 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○○○○○○○○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
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_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
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_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
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_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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.

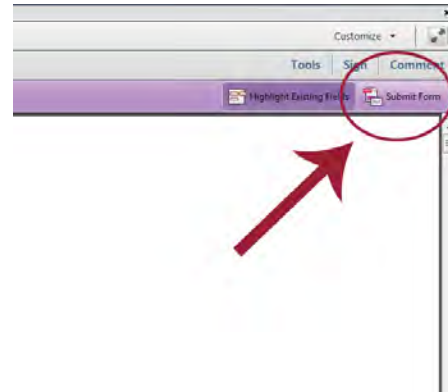
Any Other Organization/ Affiliation (if Any):	Name of Person With Whom You Initiated Communications	Average Frequency of Communications (#/year)	Average Importance Of Communications (1 - Low; 7- High)	Type of Communication
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
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_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> Business/Market/Financial
_____	_____	_____	1 2 3 4 5 6 7 ○ ○ ○ ○ ○ ○ ○	<input type="checkbox"/> Product/Service/Technical <input type="checkbox"/> 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*

CRÉATION DE SAVOIR (MÉMOIRES DE RECHERCHE ET RAPPORTS)

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SOBEY SCHOOL OF BUSINESS

WORKING PAPERS SERIES

No. 2015-01

Dr. Ellen Farrell

Nathan Dennison

**Measuring and Mapping Knowledge-Seeking Behaviour in an
Entrepreneurial Ecosystem**

 Ellen Farrell¹ and Nathan Dennison²
Sobey School of Business, CANADA

Presented at Financing Knowledge Transfer Conference, Rimini, Italy April 16, 17, 2015

**MEASURING AND MAPPING KNOWLEDGE-
SEEKING BEHAVIOUR IN AN ENTREPRENEURIAL
ECOSYSTEM**
Abstract

Interest in entrepreneurial ecosystems has intensified with the acceleration of the importance of entrepreneurship and with the success attributed to specific locations such as Israel, Silicon Valley, Route 128 in Massachusetts, as examples. The discussion has principally focussed on historical ethnographic account of the interactions of personalities, events, the actions of various companies, the recycling of talent, and the composition of a variety of different types of actors and groups in the ecosystem. The research outlined in this report responds to the need to study the dynamics of differing entrepreneurial ecosystems and the investigation of their context and institutional characteristics (Autio, Kenney et al. 2014). We measure the knowledge-seeking behaviours of participants in an ecosystem and chart them using network theory. Stripping away various elements of the ecosystem shows the relative importance of the remaining actors. The results demonstrate that the ecosystem performs better when all of the components are contributing. Network average degree weightings decline when any of the supportive constituents is missing. The work contributes to understanding the relative relationships in this ecosystem and suggests implications for comparison work with other regions.

*The authors would like to recognize the contribution made by the Province of Nova Scotia for sponsoring the original research into the Atlantic Entrepreneurial Ecosystem. Any of the comments made in this report are the sole responsibility of the authors and do not reflect the view, opinions or policy of the Province of Nova Scotia.

Presented at Financing Knowledge Transfer Conference, Rimini, Italy April 16, 17, 2015

This paper is an earlier version of the paper, 2016-03, Quantitative Analysis of the Atlantic Entrepreneurial Ecosystem's Innovation Activities. This paper outlines the knowledge-seeking behaviors by type of organization and type of information sought. The later paper, noted here as 2016-03, demonstrates the remaining knowledge-seeking capacity of the ecosystem when one constituency is withdrawn.

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Introduction

Interest in entrepreneurial ecosystems has intensified with the acceleration of the importance of entrepreneurship and with the success attributed to specific locations such as Israel, Silicon Valley, Route 128 in Massachusetts, as examples. The discussion has principally focussed on historical ethnographic account of the interactions of personalities, events, the actions of various companies, the recycling of talent, and the composition of a variety of different types of actors and groups in the ecosystem. The research outlined in this report responds to the need to study the dynamics of differing entrepreneurial ecosystems and the investigation of their context and institutional characteristics (Autio, Kenney et al. 2014). We measure the knowledge-seeking behaviours of participants in an ecosystem and chart them using network theory. Stripping away various elements of the ecosystem shows the relative importance of the remaining actors. The results demonstrate that the ecosystem performs better when all of the components are contributing. Network average degree weightings decline when any of the supportive constituents is missing. The work contributes to understanding the relative relationships in this ecosystem and suggests implications for comparison work with other regions.

Regional Advantage

Entrepreneurial innovation is thought to be a competitive advantage of a nation (Baumol, 2002). Yet nations can be large, and smaller regions have come to dominate success in entrepreneurial innovation. Concentrated systems of entrepreneurial innovation in specific regions has spawned the terminology of entrepreneurial ecosystems. The term goes back beyond 1995 (Bahrami and Evans 1995) where the most famous entrepreneurial ecosystem in the world, Silicon Valley, was characterized by “fleeting opportunities, shifting customer preferences, cascades of technological innovations, brutally short product life cycles, and furious global competition” (p. 62).

In the 20 intervening years, entrepreneurial ecosystems have evolved to represent “networks of actors contributing to joint value creation” and that had “undertaken some degree of co-innovation or adaptation” (Overholm In press). By now, however, the study of networks based on social constructs are far more prevalent (Pentland 2014) and knowledge-exchange systems that are defined by cooperation need not be spatially proximal or have a local context. This work adopts a general term of entrepreneurial ecosystem to describe a system that has elements of co-location and clustering, but that can also have the far reaching element of networks and innovation systems.

While there is a tendency to place successful ecosystems within their current day context, most of the former, and currently successful, systems have roots well back into the 1940’s and 50’s and for some, beyond that. The success of regionally-based entrepreneurship undertakings focussed attention on locations such as Silicon Valley, Route 128 in Massachusetts, Start-up Nation Israel, Silicon Glen in Scotland and Sophia-Antipolis in France to name a few. Some attention has been paid on less-than-successful locales (Honig and Black 2007) as well. The following section briefly investigates some of these ecosystems.

Silicon Glen

The Scottish example of Silicon Glen is a notable example of an entrepreneurial ecosystem because of the small population of the country, only 5,000,000 persons, and its unusual up then down results (Galbraith, Rodriguez et al. 2008). Unlike Silicon Valley, the region between Glasgow and Edinburgh, Silicon Glen, was created via a very planned approach.

Scotland had a comparative advantage in education and financial services (Dow and Dow 2005), but they had a low incidence of small business start-ups (Dow and Kirk 2000). With a previous background in heavy manufacturing, agriculture and shipbuilding, the policy initiatives by local Scottish governments were intended to attract international technology-based firms to Scotland to expand its local high-technology manufacturing and entrepreneurial base (Galbraith, Rodriguez et al. 2008) using economic development initiatives combined with the provision of grants (McCann 1997). The policy led to an insurgence of US, Japanese and Korean electronics firms that created jobs and the region grew to encompass manufacturing, electronics, life sciences, software, optics and instrumentation.

While there was significant co-location of large international firms, there occurred few technological spin-offs. The policies developed showed some significant successes followed by periods of significant failure (Honig and Black 2007). Decades later and the subsequent terminations of the international technology companies, little indigenous growth had resulted (Dow and Kirk 2000).

Route 128

The 100-year history of Route 128 also has a significant presence in the literature of regional advantage and was the first highly successful ecosystem in the U.S. The success of Route 128 in Massachusetts was born out of early research collaborations between MIT and large firms clustering about the information, defence and communications technologies. MIT pioneered corporate cooperation building relationships by means of business consultancies, research contracts, apprenticeships, spin-offs and venture capital funding with large enterprises. This was bolstered by the highest concentration of hospitals, research institutes, colleges and universities in the world (Hulsink, Manuel et al. 2007).

Within walking distance of Harvard, research centres and industrial laboratories, MIT and Route 128 had exceptional communications capabilities taking advantage of the beneficial consequences of social exposure. Massachusetts grew to be amongst the leading states in patents per capita, invention disclosure, licenses issued and venture capital and the number of initial public offerings (Rosegrant and Lampe 1992).

In the late 20th century, Route 128’s relative fame was eclipsed by Silicon Valley. In Saxenian’s (1994) cultural review of Route 128, she characterized the New England area as having a more hierarchical and old world social order. The New England area had a

social order where schools and churches and family and social class still maintained importance – a world where hierarchical order was central. This social norm was reflected in business interactions as well. Businesses were more stable and less risk taking; they had fewer connections between companies and fewer spin-offs. Proprietary products and systems were a way of reducing competition, and vertically integrated companies developed and operated under a more closed innovation method.

Silicon Valley

Silicon Valley's rise to regional prominence began to emerge in the 1970s and 80's. They developed many of the university and business relationships as did MIT, but Silicon Valley had a different business culture and social order (Hulsink, Manuel et al. 2007). Resting heavily on the incubation centres, science parks and technology centres established at Stanford. Silicon Valley was able to adapt to rapidly changing paradigms and industrial prominence. The industrial base at Silicon Valley spanned microprocessors, discs and storage, the manufacture of parts and peripherals, Internet-based technologies, and the current day intermediating services delivered over the Internet.

Silicon Valley's ability to try, test, fail, recycle people and reinvent new firms is still considered revolutionary. The ecosystem is resilient in its ability to rejuvenate itself. The Stanford connections and Valley network fostered a business structure of mutually dependent, highly specialised companies where the risks associated with failure were, and are, accepted (Hulsink, Manuel et al. 2007, p 19). "Paradoxically, while high-technology firms experience a high failure rate, Silicon Valley continues to thrive and prosper. In this domain, the demise of one firm invariably leads to the formation of others, directly and indirectly. This process of 'flexible re-cycling' can result in novel reconfigurations of knowledge and human capabilities, allowing new firms to rise from the ashes of failed enterprises" (Bahrami and Evans 1995).

Sophia-Antipolis

Sophia-Antipolis, in France, is an example of a cluster developed largely artificially through planning and regional policy. Described as a "City of Science, Culture and Wisdom" (Ter Wal 2013 p. 653), Sophia-Antipolis was the creation of a private interest who hoped the sunbelt region may be attractive to investment and entrepreneurial candidates. As time passed and costs of the effort mounted, public officials of the Côte d'Azur came on board as an effort to diversify the area's principally tourism economy.

Unlike the other examples of entrepreneurial ecosystems, when the first buildings were erected in 1972, Sophia-Antipolis had no industrial or university tradition at its core (Longhi 1999). It largely attracted non-European firms that wanted to adapt their products to suit a European market. However, the addition of France Télécom and its efficient fibre-optic network was a drawing card. But rather than spawning entrepreneurial ventures, Sophia-Antipolis was initially a home to subsidiaries. Remarkably, in a move from exogenous to endogenous growth, the University of Nice and National Centre of Scientific Research were established in the region. It was not until much later, when some of the large companies decided to move, that a labour force -

- unwilling to move -- began to start their own firms (Quéré, 2007). The innovation networks were lopsided, however, benefitting IT with a stronger culture of spin-offs and high technology growth than the life sciences group that was not so influenced by the co-location (Ter Wal 2013).

Study Purpose

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 (Saxenian 1994). Other than the ethnographic and historical accounts noted earlier, some of the work highlighted the groups of constituents contributing to the ecosystem to build models illustrating the flow of activities amongst the groups (i.e. Bahrami and Evans 1995; Ferrary and Granovetter 2009). Some others construct economic models using expenditure and investment data, for example (McCann 1997). Autio, Kenney et al. (2014) 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 (Galbraith, Rodriguez et al. 2008), and interpretive analysis resulting in theoretically constructed propositions (Honig and Black 2007). A longitudinal analysis of the inventor networks highlighted the emergence of clusters and networks in specific industrial classifications (Ter Wal 2013).

The purpose of this study is to investigate the relationships amongst the various groups of actors within an entrepreneurial ecosystem in a more structured manner by using network theory to show the distribution of information-seeking activities as well as quantitative measurements amongst the constituents. This attempts to introduce context by avoiding focus on the firm or the entrepreneur, but introduces a more quantitative approach. We conduct this study using an entrepreneurial ecosystem located on the east coast of Canada where the foci are a number of small provinces that are sparsely populated. This is in sharp contrast to the methodologies currently seeking to study the context of entrepreneurial ecosystems.

The paper proceeds as follows. First we describe the Atlantic Entrepreneurial Ecosystem and its acceleration over the past decade. The methodology for studying the ecosystem follows, this outlines the type of study, the sampling methodology, the survey protocol and type of analysis. The descriptives of the respondents are included there. The next section contains the results, including network charts and tables of measures. The paper concludes with a discussion of the implications, limitations and opportunities for further research.

Atlantic Entrepreneurial Ecosystem

The Atlantic Entrepreneurial Ecosystem is centered on the east coast of Canada with a hub in Halifax Nova Scotia and another in Fredericton, New Brunswick, two small sparsely populated provinces. The provinces of Prince Edward Island and Newfoundland and Labrador round out what is referred to as Atlantic Canada. With approximately three percent of the nation's population, the region suffers difficulties. The most populous province, Nova Scotia has a population of only 943,000 (Statistics Canada 2014B), and currently suffers from a declining birth rate as well as declining population. The number of births in the Province dropped by 6 percent between 2010-2014. The mean family income in Nova Scotia is \$66,590, with the median income at \$53,606 (NS Dept. of Finance 2014).

Nova Scotia's private sector R&D expenditures are well below the Canadian average, with total expenditure of \$503 million (CAD) in 2012 (Statistics Canada 2014). Canada-wide, private business R&D expenditures contribute 50 percent of the total on average. In Nova Scotia only 16 percent is contributed to R&D expenditures by private business (Statistics Canada 2014). This point is further emphasised when the Province's gross expenditure on research & development is expressed as a percentage of gross domestic product. This percentage is only 1.3% for Nova Scotia as compared to 1.8% for Canada.

Traditionally focussed on fishing, forestry, and some large industrial pulp and paper and tire manufacturing plants, the sources of these higher paid skilled labour positions are diminishing. One large pulp and paper manufacturer is closed and another faces a precarious future with odour levels that are challenging to correct. One of Michelin's major tire plants has announced its closure. The current trend sees many families supported by Nova Scotians working in oil fields in western Canada and commuting between Alberta and Nova Scotia on a three- to six-week schedules. More recently, the declining price of oil raises concern about even this form of employment. In February, 2015 Alberta lost 14,000 jobs (Babad 2015), many of them expected to be migrating workers from Nova Scotia.

Yet the Province is very well suited to see significant growth in its GDP by transitioning towards a knowledge based economy. In recent years the foundation for this has been facilitated by the urbanization of the population, as well as the Province's high levels of post-secondary education. With 10 universities, and 13 community college campuses, Nova Scotia produces more post secondary graduates per capita than any other Canadian province. However, despite these encouraging factors, the shift away from Nova Scotia's traditional foci has been slow and the outpouring of youth to western Canada is likely to continue (Babad 2015).

Due to the combination of a declining growth rate in Nova Scotia's population and traditional industries along with their knowledge-based positioning, all three levels of Canadian government have begun to devote resources to encourage growth in the local innovation ecosystem.

Halifax, Nova Scotia's capital city, is the largest population centre in Atlantic Canada and is home to 43 percent of the Province's residents (Halifax Partnership 2014). The city has been recently experiencing a growth in university enrolments that are twice the national average. This strong academic presence contributes significantly to the R&D expenditures in the region, accounting for 74 percent of the total (Statistics Canada 2014).

With some of Canada's oldest and top rated universities, Halifax is turning its focus towards entrepreneurship, and the knowledge transfer from academia to the private sector. There has long been a foundation of support organizations, from the private sector such as Entrepreneurs Forum (founded 1992), from the federal government such as Atlantic Canada Opportunities Agency (formed 1987), and from the Provincial government with Innovacorp (formed 1994), in the city. By 2000 there were a number of government (Innovacorp, NSBI, Investment New Brunswick) and private venture capital (ACF) options in the region, and more were to come. An online, publication called *Entrevestor* was founded with the help of local governments. This publication followed the developing entrepreneurial ecosystem, with an explicit focus on technology enabled high growth firms.

This foundation, however, saw tremendous growth in the aftermath of a \$350 million exit and \$640 million exit (reputed) of two entrepreneurial firms in nearby New Brunswick. Radian 6 and Q1Labs had similar founders, investors and were both ICT firms. Respectively, they were sold to Salesforce.com and IBM. In 2012, Halifax-based firm, GoInstant, also sold to Salesforce.com. These exits developed a flow of capital into the region, and some of the founders and early investors recycled their new wealth into the founding of incubators (Volta Labs), accelerators (Launch 36), university support systems (Pond Deshpond Centre) and innumerable programs and pitch contests to encourage young entrepreneurship.

The longstanding entrepreneurship program at Saint Mary's University, a major business school in the country, was then supported by Dalhousie University's Starting Lean course and a new Masters in Technology Entrepreneurship and Innovation at the Sobey School of Business.

Methodology

The methodology to effectively measure and map an ecosystem quantitatively is best undertaken with a field study of the knowledge-seeking behaviours of constituents of an entrepreneurial ecosystem. Using a snowball sampling method, a survey investigated the knowledge-seeking behaviours of constituents of the ecosystem as well as the importance and frequency of the ecosystem's participants' knowledge-seeking activities. The data was analysed using network theory. A more detailed description follows.

Measures

Alvarez and Barney (2007, p 126) noted that the central measure used in the opportunity literature were “actions that entrepreneurs take to form and exploit opportunities,” but not all entrepreneurial actions are innovative (Bosma, 2009). So where performance is driven by entrepreneurial innovation which is a function of entrepreneurial behaviour (Autio, Kenney et al. 2014) knowledge-seeking behaviours were used as the best indicator for entrepreneurial innovation.

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. Three dimensions were investigated regarding each knowledge-seeking activity: importance, frequency and type of information sought. The number of times an ecosystem member reached out to someone else was measured, and the importance of the information to the seeker was measured with a seven-point Likert scale. The types of information sought were assessed as either business/market/financial information or product/scientific/technical information.

The survey protocol was executed by means of a “fillable form” survey. Returned surveys implicated other companies which were then sent a survey regardless of their physical proximity to the respondent. This type of survey distribution was adopted to avoid services such as Survey Monkey to ensure that the process of exporting data from the surveys occurred on servers owned, and operated, by Saint Mary’s University, as opposed to an independent third party. By ensuring that this data was only retained by the University we were able to better ensure the confidentiality of all personal information collected.

Sample Selection

The sample began with a list of qualified potential respondents drawn from media sources within the entrepreneurial community of Atlantic Canada. The technique of using snowball samples, or respondent-driven sampling, is appropriate for network analysis (Biernacki, 1981). With respondent-driven sampling, respondents indicate persons from whom they sought advice/information/knowledge about entrepreneurial ventures. The individuals noted by each respondent become the source for enlarging the sample and developing new potential respondents.

There is no list *per se* of all entrepreneurs and all firms and all agencies providing services to entrepreneurs so the boundaries are estimated by the participants of the snowball sample. Using this method, it is possible to access hidden agents participating within the Entrepreneurial Ecosystem. It is also recognized some influencers will not be part of the sample.

To develop a targeted distribution list for the Atlantic Entrepreneurial Ecosystem survey a base list of 75 qualified respondents was compiled. These included individuals in organizations that composed the various constituent groups in the ecosystem. The list of

qualified respondents was generated by carefully evaluating personal contacts of the lead researcher, Entrevestor, AllNovaScotia.com, and the online networking site, LinkedIn.ca. Those identified by these sources were the initial recipients of the survey. This distribution grew from the initial group of recipients, to 450 recipients in the first week, and snowballing to, and concluding with, 886 recipients after the final (fourth) week of distribution. A large proportion of the final group were not in any physical proximity to the Atlantic region.

This type of survey distribution was adopted to avoid services such as Survey Monkey to ensure that the process of exporting data from the surveys occurred on servers owned, and operated, by Saint Mary’s University, as opposed to an independent third party. By ensuring that this data was only retained by the University we were able to better ensure the confidentiality of all personal information collected.

Data Collection

All emails were addressed to respondents under the principal author’s email to take advantage of her name recognition and to add academic credibility to the requests. Most data was obtained in pdf fillable forms and was exported to a csv file. Therefore, information provided by emailing the fillable form populated the database automatically. Cleaning and coding the data was took place. The data are analysed using the complex network theory program, Gephi (Cherven 2013). Sampling techniques, the data collection, and the survey descriptives which highlight the characteristics of the respondents follow.

Table 1 - Example of Gephi 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

Gephi created *arcs* for each line of the dataset, each of which required two *nodes*. Many duplicate nodes are consolidated to produce a network graph which introduces the concept of centrality in network theory. Because the entrepreneurial network data is from various types of agents (venture capitalists, entrepreneurs, universities, accountants), research assistants manually coded organizational types as well as the geographic data.

Survey Descriptives

Table 2 describes the response and network descriptive. The survey instrument was responded to by 95 individuals (some of whom declined to participate for specific reasons). The survey was completed by 79 respondents. The total number of different

firms to which the respondents referred was 781. A total number of 1477 knowledge-seeking transactions were engaged in by the ecosystem.

Table 2 - Network Descriptives

Network Descriptives	Count
Individuals responding to survey request (#)	95
Completed Surveys by Individuals (#)	79
Number of firms reported overall	781
Male/Female (%)	75/25

The nature of the respondents' capacities within the ecosystem follows. Respondents were permitted to self-identify into more than one category. Most of the respondents were entrepreneurs (46.8%) and a class of individuals who reported themselves as consultants (36.7%). As a collection, the next largest group were the venture capitalists (15.2%), the private individual investors (10.1%) and a member of an angel network (1.3%). Professors from the local universities and colleges represented 12.7 percent of the respondents' professions.

Table 3 - Self Identification of Profession (More Than One Category Possible)

Self Identified as	Percent (%)
Entrepreneur	46.8
Venture capitalist	15.2
Private Individual Investor	10.1
Member of Angel Network	1.3
Lawyer	1.3
Government Representative	3.8
Consultant	36.7
Professor	12.7
Employee at a large firm	1.3
Bank Representative	1.3
Mentor	3.8

Professors aside, the level of education amongst the ecosystem is very high. Respondents were highly educated with all but two having had some form of post-secondary education. Combined, more than half of the respondents had a masters' level or a doctorate and 27.1 percent of the group had a bachelors' degree. Fourteen percent of the respondents had a professional designation. Table 4 outlines the educational profiles of the respondents involved.

Table 4 - Level of Education

Level of Education	Percent
High School/Equivalent	2.9
Vocational/Technical School	2.9
Professional Designation	14.3
Bachelor Degree	27.1
Master Degree	42.9
Doctoral Degree	10.0

Results

Three elements of the AEE are dissected in the analysis of the results. The AEE as a whole is assessed along with the functioning of the system when specific groups are removed. That is followed by an analysis of the activities of the entrepreneurs in the ecosystem. The last slice examines the activities of the entrepreneurs, venture capitalists and universities – three qualities that are always recognized in successful entrepreneurial ecosystems.

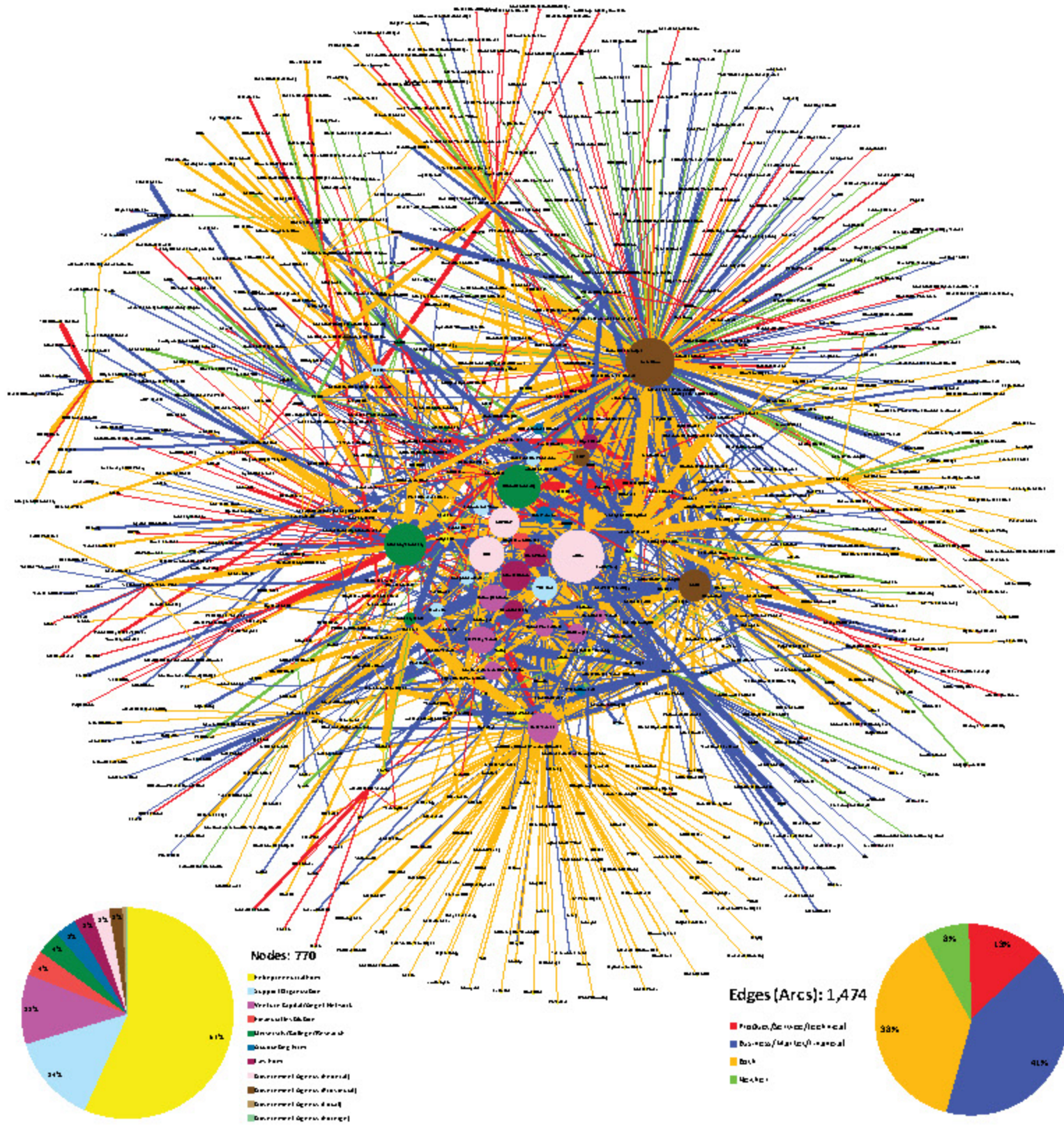
Atlantic Entrepreneurial Ecosystem

The knowledge-seeking activities of the Atlantic entrepreneurial ecosystem (AEE) are very complex. There are 780 different organizations represented in the reported AEE and 1477 separate knowledge-seeking relationships activities by 79 respondents. The image of the AEE is displayed in Figure 1. The various types of organizations identified by their colour and a legend displays the number of nodes. Fifty-seven percent of the nodes are represented by entrepreneurial firms. Support organizations, venture capital firms, universities, Federal and Provincial governments, and professional firms represent the bulk of the named organizations that were sought after for some type of knowledge. The size of the node represents the number and importance of the knowledge-seeking behaviours which others sought of the named node. The centrality of a node is an indication of its interconnectedness amongst many different information seekers.

Two key types of information were suggested as the basis for reporting respondents' behaviours. *Product or Service Technical* information indicates science-related, product, programming, equipment, or technical information. Thirteen percent of information requests were of this nature. The legend in Figure 1 displays the types of information sought. Forty-one percent of the requests were for *Business Market or Financial* information which relates to markets, administrations, funds seeking and business operations. Thirty-eight percent of the respondents were looking for both kinds of information from their knowledge-seeking activities and the remaining eight percent indicated they were looking for information other than these two key categories. Careful examination of the arcs reveals numerous other bits of information such as the direction of the information-seeking activity. The small pointed end, terminating on the periphery of a node means the information was *sought from* that organization. Avive Naturals for example has many arcs emanating from theirs. They sought information

from Perennia, NSBI, Canada Business Reference Library, Halifax Port Authority, NRC-IRAP, Export Canada and Port Mexico to name just a few. They, on the other hand, are a very small node because they have not been sought to provide information to others in the AEE.

Figure 1: Atlantic Entrepreneurial Ecosystem



The major financial institutions, universities, support groups and federal and provincial agencies are very important to the ecosystem. They are more sought-after for information and more connected which drives their nodes it to the centre of the chart. Some entrepreneurial firms that are frequently linked to these organizations are also in the centre of the chart. Many of the firms on the periphery of the chart are those from which information was sought but that have no other knowledge-seeking associations with any other company in the AEE.

A considerable proportion of the knowledge-seeking behaviours of the AEE is not proximal to the Atlantic Canada location. Approximately 75 percent of the nodes are situated in the Atlantic region. Encouragingly, 15 percent of the nodes are from the rest of Canada, nine percent are from the U.S., and one percent are from abroad. This suggests a global group reaching out for information from companies and groups around the world. If these global-facing nodes are connected to entrepreneurs it suggests an inoculation to dis-entrepreneurship as defined by Honig and Black (2007). Dis-entrepreneurship occurs when the community adopts an inward facing orientation rather than an outward orientation in a globalizing world. “Entrepreneurs finding themselves in communities characterized by strong client-patron relations would do well by appealing to broader regional institutions that frequently trump local oligopolies” (Honig and Black 2007. p 286).

One way of measuring the importance of individual groups of constituents is the proportion of relationships between the edges or arcs (the lines running from node to node) and the number of different constituents (number of nodes). This is called the Average Degree statistic. A larger Average Degree statistic (Arcs/Nodes) indicates that more knowledge-seeking behaviours are taking place per member of the ecosystem.

Table 5: Ecosystem Statistics With and Without Various Ecosystem Groups

	Entire Ecosystem (EE)	EE Minus Federal Participation	EE Minus Provincial Participation	EE Minus Support Orgs	EE Minus University Participation	EE Minus Venture Capital
NODES	770	752	571	633	692	584
EDGES	1474	1359	1059	1145	1282	1045
AVERAGE DEGREE	1.914	1.807	1.855	1.809	1.853	1.789
AVG WEIGHTED DEGREE	12.481	11.669	10.737	12.104	12.172	11.844

Table 5 shows the AEE without various groups of constituents as comparators. The average knowledge-seeking activity decreases when any group is removed from the ecosystem. For example, when the Federal Government’s participation is removed from the AEE, the AEE’s average degree declines from that of the average degree of the whole ecosystem; the entire ecosystem’s knowledge-seeking activity level improves when Federal participation is included. Federal Government constituents punch above their

weight in the AEE because the ecosystems' arcs per node declines when the Federal Government is absent. The AEE is most hampered if the Province is withdrawn likely because of the contribution of government-sponsored venture capital in Innovacorp, NSBI and Build Ventures.

A similar situation occurs when considering all of the other major groups noted in Table 5. Removing any one of them causes the average degree of knowledge-seeking behaviours to decline. The AEE is more knowledge-seeking when all the major groups of constituents are in place.

The average weighted degree takes into account the combined importance weights indicated by the respondents to the survey – the *value* of the information sought by the seeker. A higher value indicates more importance. In Table 3, the Weighted Average Degree of the AEE is 12.481 when everyone is participating. However, the AEE's average weighted degree declines the most, to 10.737 when the Provincial governments' contributions are removed (two early-stage venture capital funds).

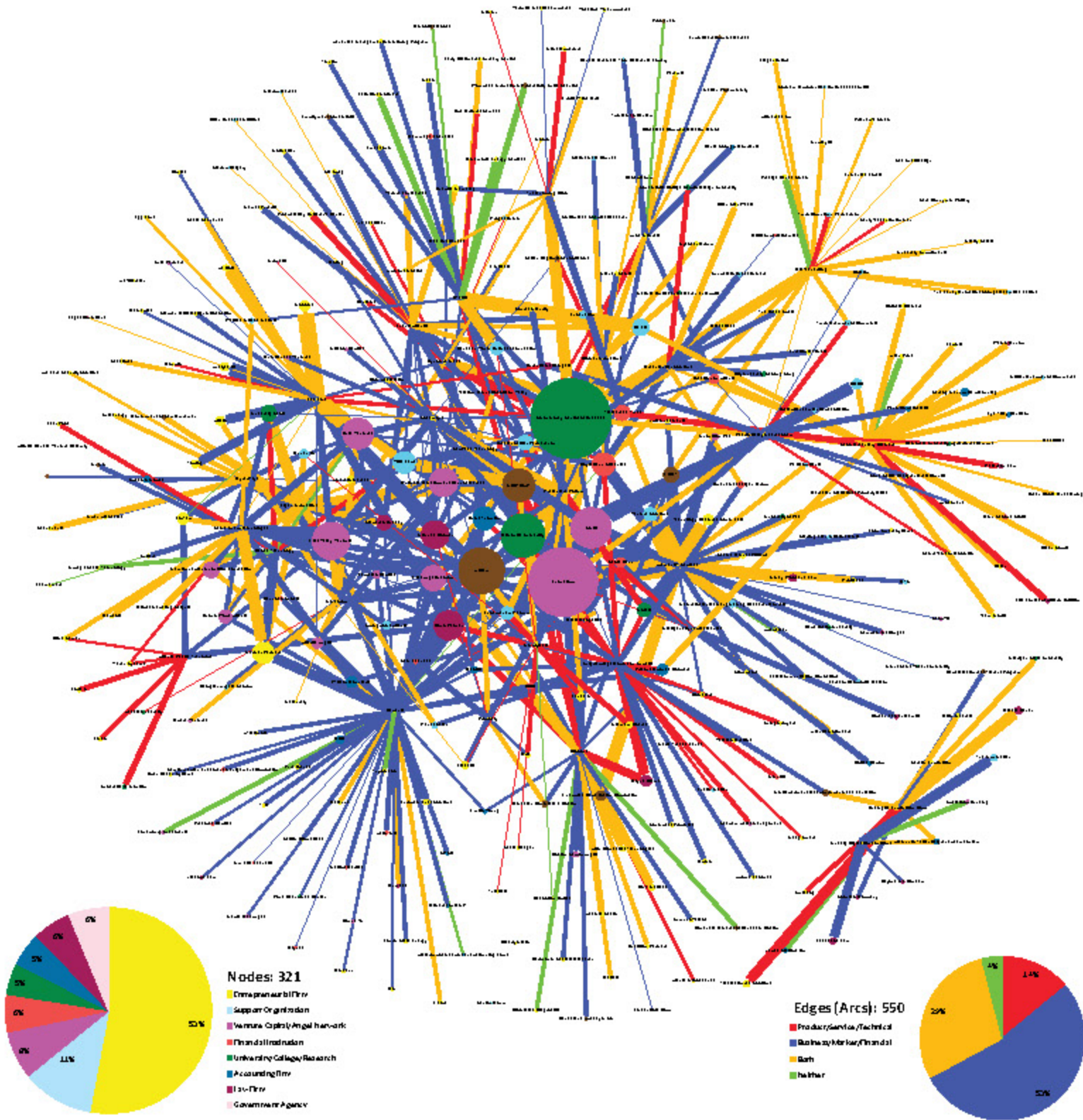
Knowledge-Seeking Activities of the Ecosystem's Entrepreneurs

If one is to assess the overall ecosystem by isolating groups of constituents in order to determine their importance to the ecosystem (above), it is useful to isolate the activities of the entrepreneurs and view their activities in isolation. The complement then is the remainder of the AEE. Table 6 shows the outbound activities of the entrepreneurs, who they reached out to, what organizations their engagements are devoted to, and what type of information they were requesting.

Table 6: Outbound Knowledge-Seeking Behaviours of Entrepreneurs by Type of Organization and Type of Information Sought

Entrepreneurs Reached Out To	Count (#)	Of Total (%)	Product/Service/ Technical (%)	Business/Market/ Financial (%)	Both (%)	Neither (%)
Other Entrepreneurial Firm	165	30.0	15.4	37.6	39.4	6.7
Support Organization	69	12.5	14.5	47.8	37.7	0.0
Venture Capital/Angel Network	96	17.5	6.3	69.8	20.8	3.1
Financial Institution	43	7.8	11.6	65.1	18.6	4.7
University/College/Research	48	8.7	29.2	45.8	25.0	0.0
Accounting Firm	33	6.0	6.1	69.7	18.2	6.1
Law Firm	42	7.6	19.0	61.9	19.0	0.0
Government Agency	54	9.8	9.3	57.4	25.9	7.4
ALL	550	100	14.0	53.1	28.9	4.0

Figure 2: Outbound Knowledge-Seeking activities of Entrepreneurial Firms



The left panel of Table 6 shows that entrepreneurs' activities represent approximately one-third of the system's knowledge-seeking behaviours (550/1477). The largest proportion of their effort is expended on soliciting knowledge from other entrepreneurs (30.0%). Reading across to the right panel, the information they most frequently seek relates to business/market/financial advice 37.6 percent of the time.

Venture capital/angel networks (17.5%) and supportive organizations (12.5%) are the next most frequently sought-after groups for information by entrepreneurs. The nature of the information sought from both of them is overwhelmingly business/market/financial driven (68.9% and 47.8% respectively). None of the remaining groups takes any more than 10 percent of the information-seeking activities of entrepreneurs in the ecosystem.

In sum, the entrepreneurs are reaching out to an average of 10.7 other organizations over the course of the previous year. This seems light though recall biases might reduce their reporting of who they reached out to. By comparison, the other actors in the AEE, the VCs, the federal and provincial governments, support groups, etc. are reaching out to 14.7 other organizations. So the entrepreneurial group is less active than the other organizations in the system as it relates to knowledge-seeking activities.

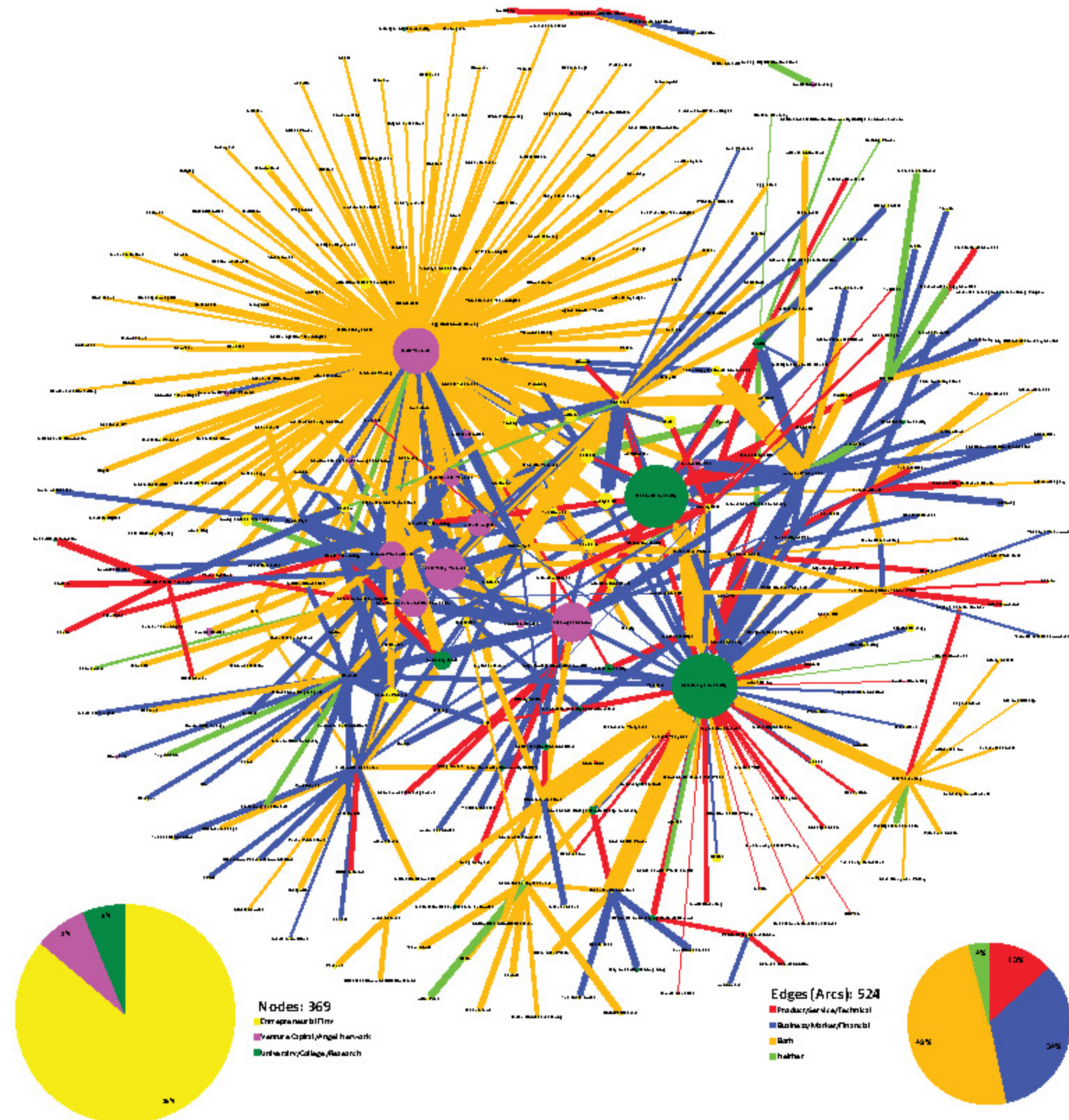
The vast amount of knowledge-seeking is related to business activities, rather than technical, scientific or product execution activities. In each and every category of outreach, the entrepreneurs are overwhelmingly requesting business, market or financial information. This is somewhat surprising.

Knowledge-Seeking Activities of Universities, Venture Capital and Entrepreneurs

The stories of Silicon Valley and Route 128 were both dominated by the active participation of universities and personalities within those institutions (Saxenian 1994) and the contribution of available finance and venture capital were considered very valuable (Ferrary and Granovetter 2009). This analysis considers these three components of the system as a group.

The chart showing the interactions amongst the universities, venture capital firms and the entrepreneurs is composed of 369 firms, the vast majority of them being entrepreneurial firms. There are 1.8 edges per node and the importance of the transactions is high, a weighted average degree of 11.6. This represents about half of the nodes and a third of the edges in the entire AEE. Again, the universities and the venture capital firms are driven to the centre of the chart highlighting their interconnectedness and thereby their importance to the structure of the ecosystem.

Figure 3: Knowledge-Seeking Activities of Entrepreneurs, Universities and Venture Capitalists



An examination of the entrepreneurial firms shows little interaction with other larger firms which has been an approach used in other ecosystems. The mixing and recycling of talent amongst large and smaller firms produces knowledge spinoffs that benefit both parties. Modest encouragement by larger companies in the Province can provide exceptional opportunities developing founders, and very early-stage ventures benefit from close proximity to, and mentorship by, successful high growth firms. Established innovating businesses can mentor aspiring technology oriented entrepreneurs to absorb business models, mentorship, technology, management practices, and the culture of fast-growing businesses.

There is little independent private venture capital in the AEE. Most of the firms are government-sponsored venture capital attempting to fill financing gaps. The larger ones are those which fulfill a government, or quasi-government mandate. For some of them, their mandate has expanded to provide a supportive and mentoring capacity in the ecosystem as well as incubating opportunities.

The universities are sources of both business and technical information for entrepreneurs and founders. This is demonstrated in the different colour arcs emanating from the universities. It is promising to see the role that the universities play in the previous iteration of the ecosystem, but in particular with this iteration, of the entrepreneurial firms. This chart's high average importance rating indicates its value. Clearly, the efforts that are being spent on entrepreneurship education inside the Universities are resulting in considerable involvement. The high levels of education of the AEE's constituents is no doubt related to this observation.

Implications & Future Research

Inviting international firms to jump-start a region is a zero sum game since some other region loses by their choice of location (Acs, Glaeser et al. 2008), or incentives to relocate draw down the benefit of their movement into a region. Silicon Glen failed to see any appreciable entrepreneurial activity from this policy. Others have benefitted from historical clusters of a specific sector which resulted in significant spillovers, and some appear to have succeeded by serendipity and the benefits of geography and maybe a university or two (Acs, Glaeser et al. 2008). These are hard to replicate. Contributing to the mix of attributes, processes, and constituents that most foster entrepreneurial ecosystems, and the context in which they operate, is the aim of this research.

This research calls attention to the multiple parties needed to stimulate entrepreneurial ecosystems (Van de Ven 1993), and addresses a more recent call for investigations into regional and contextual influences on entrepreneurial innovation (Autio, Kenney et al. 2014). This work seeks to expand the knowledge of entrepreneurship by focussing on the context of an entrepreneurial ecosystem's knowledge-seeking behaviours. It does so with a revealing visual and quantitative examination of entrepreneurial ecosystems' knowledge-seeking behaviours. The use of network theory is a unique contribution to the

entrepreneurial literature as well as network theory literature, and its use endeavours to tease out specifics regarding the nature of the ecosystem's functioning.

Knowledge-seeking networks amongst an ecosystem open the founder to complementary competencies and resources to gain access to new knowledge and people. Networking is an active way to create entrepreneurial opportunities for high-tech innovation, and high-tech founders exploit existing opportunities and deploy their networks to form new contacts and relationships that form new opportunities (Moensted 2010).

The interconnectedness of the constituents in the AEE is amply highlighted in the charts presented earlier. Moreover, the metrics associated with the analyses specifically demonstrate the dwindling effectiveness of the AEE's knowledge-seeking behaviours when any one of the major 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. This is corroborated by extant research. It is recognized that governments cannot establish, or mandate, an entrepreneurial ecosystem (Soto-Rodríguez 2014), only the value creation contributions of many actors working in concert through their interconnectedness (Cohen 2006) results in a functioning and sustainable ecosystem.

The AEE has a global orientation. Many of the organizations implicated by the respondents were outside of the Atlantic region. More research is needed to examine whether the founders specifically had a global orientation, or whether it is other constituents who are reaching out to the world. Circumstances that cause dis-entrepreneurship may be obvious if their entrepreneurship activities cause their communities to fail to grow resulting from weak local investment, failure to take advantage of policy opportunities or poor infrastructure (Honig and Black 2007). Similar analyses of other ecosystems may highlight variances when contexts and qualities are contrasted.

Entrepreneurs' overwhelming search for business, market and financial information rather than technical/scientific/product information is a surprising finding. A number of reasons may explain it. If entrepreneurs are competent in their design, science and production of their products, their needs may be largely related to the development of markets, delivery of product, sales techniques and methods of building a firm. That would be reassuring. In an area of challenged resources and financial capabilities, the search for business acumen and finance may be expected. However, if the entrepreneurs are spending most of their time on business-building activities with little or no product innovations or design improvements, difficulties related to immature innovations may prevail.

Further research opportunities abound using this method. Other research may answer questions about the mix of qualities that are necessary for successful ecosystems and provides opportunities for comparison. Is there more or less focus on university, or professional support, or venture capital funding, or incubators or accelerators in the winning regions compared to those less successful ones? Does success have more to do with the social order, or social capital? Is it influence, contacts, and networks that drive successful ecosystems, or is it capability of a number of key players that lubricate them? Is there a critical mass of venture capital required to grease an entrepreneurial ecosystem? Is there a critical mass of people working in a similar area that drives a cluster to become an innovation network? And if so, what is that critical mass? Future research may seek to investigate these areas.

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OPPORTUNITIES FOR SYNDICATION IN A GOVERNMENT VENTURE CAPITAL DOMINATED ENTREPRENEURIAL ECOSYSTEM

Presented at Business and Economics Society International, July 9-12, Portugal, 2015 Accepted for publication in 2015 Global Business and Economics Anthology

Opportunities for Syndication in a Government Venture Capital Dominated Entrepreneurial Ecosystem

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*Presented at Business and Economics Society International, July 9-12, Portugal, 2015
Accepted for publication in 2015 Global Business and Economics Anthology*

Abstract

Syndication brings more specialized and domain-specific investors to participate in venture capital investments with local government-sponsored venture capitalists. Local and regional government-sponsored venture capital funds can have difficulty sourcing syndicating investors. This research explores the candid observations of potential syndicating venture capitalists and their likelihood and propensity to invest alongside small regional government-sponsored venture capital funds. Issues relating to the capabilities of local fund managers, valuations, contracting provisions, and the alignment of motives required co-invest together are discussed. The overriding factor that syndicating venture capitalists like to do business with colleagues they have come to trust can limit the local venture capitalists' abilities to leverage the public funding provided by local government-sponsored venture capital funds.

Keywords: syndication, government venture capital, valuation, entrepreneurial ecosystem

Introduction

Syndication is vital for most venture capital-backed firms because of the need for successive waves of increasingly larger finance as the firm rapidly grows. There are three major components in the equation for syndication: the founders, the local VC investors, and outside co-investors invited to participate in financing a deal – the syndicators. The founders sell equity from their newly burgeoning firms to a venture capitalist (VC) and syndicating venture capitalist (SVC) who purchase the equity with capital from the funds that they manage. Syndication is a method to share risk by reducing the amount of investment that must be contributed by each VC, and by allowing the participating funds to include more investments in their portfolio (group of investees financed by a fund), and is a means to validate their decision-making

Most syndicated investments are characterized by two groups: the VC who identified the founder as an attractive opportunity, usually within reasonable

proximity to the founder, and the SVC that the local VC invites to participate in the financing. Isolated locales, or regions bereft of any venture capital often have government interventions to fill financing gaps for founders and their fledgling firms. These government-sponsored venture capitalists (GVC) tend to operate within a specific geography, have no specific domain expertise, nor a specific strategy, and are often saddled with diverse economic objectives such as job creation.

A syndicating VC, however, can originate from anywhere and is invited to participate in the deal by a local GVC. A VC in Chicago that has a specialty in photonics can be invited to participate in a local deal with a GVC because syndicators rely on the local GVC to monitor and provide oversight for any co-investment they might do together. Thus, the geographic range of a syndicator and their money is theoretically limitless.

Syndication fuels the venture capital system. Because one can invite syndicators from around the world, there is essentially an unlimited stock of syndication capital available. Indeed, there are U.S. funds making investments in Asia and European funds making investments in Canada. Someone from the U.K. can invest alongside a local VC to fund a Nova Scotian company (a current situation). With an unlimited number of VCs to work with from around the continent, the stock of syndication funds is vast.

Yet, what is the reality of such deals. The nature of the relationship between local GVC and SVC forms the purpose for this study. The perceptions of SVC as they relate to syndicating with GVC are largely unknown and this explorative study undertakes to identify candid sentiments by SVCs about their interests in participating with local/regional GVC. The research question is relevant because it assesses the impact of the local GVCs relationship building efforts with the potential SVC industry, and it investigates how SVC view local GVC personnel and activities. Their observations could be practically instructive for GVC. Moreover, VCF rationales for their observations give rich context to the quantitative developments in the industry.

The study proceeds with an investigation of the extant research. The methodology for the study follows along with some descriptives of the respondents. The results take the form of the many topics covered by the SVCs forming the results. The paper concludes with a discussion of the findings and limitations of the work.

Extant Research

Regions attempting to develop entrepreneurial economies sometimes create government-sponsored venture capital funds (GVC) to invest in research and development (Cumming 2007) and fill financial gaps (Cohen, Gabbay et al. 2012; Mason and Harrison 2015). Less favoured economic regions embed GVC in order to counteract the tendency for VC to congregate in more metropolitan areas

(Christensen 2007). GVC have different objectives than independent or captive venture capital funds. GVC objectives often limit investments geographically to ensure the funds are invested in the immediate political area (i.e. Myles 2013). GVC investments are then used to leverage other finance (i.e. Humphery-Jenner 2012), referred to as syndication.

Venture capital syndication is financing of a founder that is shared amongst more than one venture capitalist (Bygrave 1987). As a chief method to alleviate adverse selection (selecting poor entrepreneurs), syndication relies principally on the financial need to reduce risk by diversifying their portfolios, as well as to ensure sharing and reciprocity within the industry (Lockett & Wright, 2001). The motives for syndication are more risk sharing in nature than risk reducing. Syndication is a social endorsement practice that reinforces the venture capital network and is a predictor of, and positively associated with, the expectation of risk. Low-innovation projects with lower risks have lower co-investment rates than high innovation projects with higher risks (Bygrave, 1987).

VC prefers to have syndicating partners. In so doing, they can participate in increasingly diverse investment opportunities (Alexy, Block et al. 2012). SVC reduce informational uncertainties by appraising other venture capitalists' willingness to invest (Lerner, 1994). They do this based on the superiority of decisions made when a number of independent observers agree (Sah & Stiglitz, 1986), and by taking advantage of improved information of new syndication partners during follow-on rounds (Admati & Pfleiderer, 1994). Syndication also permits VC to learn improved methods – of say, contracting – that accrue from socialization (Bengtsson and Bernhardt 2014), they benefit from greater added value due to group diversity (Ma, Rhee et al. 2013). Syndication can bring more specialized investors to participate in deals. Some venture capitalists will even reconsider investing in projects that they previously discarded because of the involvement of a particular venture capitalist (Steier & Greenwood, 1995).

VC also exploit informational asymmetries by investing in later rounds of profitable firms to boost their own reputations and returns (Lakonishok, Shleifer, Thaler, & Visney, 1991) so that they do not “*conspicuously under-perform their peers*” (Lerner, 1994, p. 18). Canadian VCF can take advantage of improved exit opportunities if syndicators are cross-border (Espenlaub, Khurshed et al. 2014) originating in the larger US industry.

Early-stage VC or business angel networks (BAN) may even prefer syndication with a larger fund to be preferable to an exit. In these cases, the long run returns from a future exit are expected to be greater than an immediate sale. The original business angel or early-stage VC will stay on as the lead and continue to play a role in advising the investee (Harrison & Mason, 2000; Murray, 1994) while bringing in SVC (Murray, 1994). It is a bit of a double-edged sword, however, because early-stage capitalists have few other options and the larger funds negotiate with that knowledge and the balance of power lays with the new investor even though the

first financier provides the support and specialisation required by the investee (Murray, 1994).

The research question investigates the willingness of private, independent SVC to syndicate with GVCs located in smaller, geographically dis-located regions. This study explores a specific locale, investigating GVC and their relationships with SVC and the perceptions of the latter in engaging with GVC.

Methodology

Investigating the syndicating practices between local GVC firms and SVC took a qualitative exploratory approach. The research question, whether the local GVC had the ability and tools necessary to drive syndicating partners into the local area, was investigated by questioning GVCs' peers outside of the local region. The impact and effectiveness of GVC and its ability to leverage funds from other sources (syndicate) was assessed by broad ranging personal interviews. Fourteen in-depth semi-structured, open-ended interviews were conducted with industry participants from across the continent. These included private and independent venture capitalists, private equity investors, and business angels. The interviews were conducted in a manner supportive of grounded theory. This means that as the interviews are being conducted, the questions evolved, and as new topics and ideas were broached, they became part of the analysis (Fendt and Sachs 2008). The questions advance as new findings about a phenomena unfold.

Fourteen participants were interviewed. All interviews were conducted in the presence of two researchers, and all but two were recorded in full. All respondents were assured of confidentiality and each participant was interviewed for between forty-five minutes to an hour. Their comments were free ranging which were later categorized into three categories: their comments about founders; their comments about GVC specifically and in general; and their comments about syndicators and syndication. This study features the latter two categories, GVC and SVC.

The open ended interviews were complemented by quantitative data analysis. Local data of numerous investments conducted within the region made a quantitative contribution to accompany the comments of the interviewees. The quantitative data were specific term sheet data of 105 GVC investments. This more complicated methodology was used because introducing qualitative material with quantitative data improves the interpretation of observations (Wiersma 1991). Combined, the naturalness of the participants' observations, and stories, along with quantitative data contributes to internal validity of an argument (Smith and Glass 1987).

Participants Selection

The sample for the qualitative interviews was derived from the list of potential syndicating relationships developed by the local GVC. Fifty-two venture capitalists from around the US and Canada were contacted by email to participate in an interview and the scope of research was outlined. Two rounds of the email were distributed. The

respondents whose comments are included in this report were those who volunteered to participate during the short two-week period allotted for these interviews. Concerns by GVC about preserving important relationships were effected by only interviewing respondents who volunteered to participate. No calls were placed to encourage participation.

Respondent Descriptives

There were numerous different types of funds represented by the respondents and not two were identical. Three funds had typical limited partner (LP)–general partner (GP) relationships and they each had different domain specialities. Two business angel organizations and investment clubs from outside the region, and the country, operated on different business models. Two respondents leaned more towards the private equity models, but were in a similar search for growth oriented companies. A corporate (captive) investor and a retail fund investment manager offered to be interviewed. Several investment managers were operating in the U.S. as well as Canada and one former Canadian investor was a serial entrepreneur who had built a very large company.

To present the diversity and breadth of the respondents, their characteristics are presented below in Table 1. These qualities describe the range of characteristics embodied by the investment managers interviewed.

Figure 1 – Respondent Descriptives

- Individuals making investments under the auspices and oversight of a collective
- Syndicators who only lead, and syndicators who never lead
- Typical LP funded and GP organized funds, and business angel network directors
- An investment club that invests up to \$300,000 per investment
- A SVC that characteristically invests \$5,000,000 - \$30,000,000 per investment
- A SVC that offers its incubation and mentoring services on an equity for service basis
- A fund that writes some of the biggest cheques in Canada
- Canadian funds, and American funds
- Controlling interest oriented private equity funds
- Silicon Valley VCs and Ivey League educated VCs
- VCs bred out of the banking industry
- An entrepreneur who built a \$2 billion company turned VC
- VCs who have worked on or advised on IPOs
- Highly successful exit participants
- Early-stage Series A investors, and later-stage Series B and C investors
- VCFs from \$200 million funds
- \$30,000,000 fund managers, and incubators whose money was half of their own.
- Angel investors outside the region, and angel networks outside the country
- Advisory practices for growth stage companies
- A Committee member to the Ontario Securities Commission

- Canadian Venture Capital and Private Equity Association representatives
- Investment managers who have traditionally made Boston financings only
- Investment managers who believe their investments should devolve outside their normal perimeter
- Advisors to capital formation in private markets in mature firms (five to 20 years) and some pre-revenue firms

Results

This section discusses GVC qualities that are related to syndicators' needs. Their opinions were solicited about the nature of valuations in the region and its importance to syndication and their perceptions, if any, of the sense of rivalry or comradery in the industry and its relevance to developing relationships. The skill set of the investing base as part of the value-added that a GVC brings to a syndication were observed.

Regional Awareness

The local area is not widely recognized as a hotbed of VC activity. SVCs varied in their knowledge about the locale; some were well acquainted and had done deals in the region, a few were discerning about it, and others were bereft of much insight into the funds or personalities that ran them. One interviewed fund had U.S. coverage northeast of Washington and was aware of the region as well as some of the local VC funds. Another interviewee has been in the region often, has invested here, and had visited some of the incubator events. He remarked that he does not know everyone in the industry in Nova Scotia, but has a sense of the active funds in the region and his company has someone out here every six months. A third participant said he had looked closely at a technology company in the region at one time, but any other contacts would have been restricted to brief calls with VCs in the area.

A U.S. SVC admitted he had no knowledge of the volume and quality of deal flow, however, he acknowledged the Canadian governments' efforts at bringing companies cross border via the Canadian consulate office. A Canadian VC noted, *"Who would they consider their VCs? I only know of two and I couldn't even tell you who they are ... and there was a new fund that started maybe a year ago that I was sort of marginally aware of ... but I don't even really know who they are ... and there were a couple of other groups that do venture stuff but are not funds by trade. So I don't really know who the folks are."*

The key investment manager for an American fund indicated he does half of his financings in Canada representing 40 percent of his capital. He likes to invest in Canada because his reputation provides a competitive advantage. *"In the States, I've only been there for five years. I'm anonymous in the States. But I'm not anonymous in*

Canada; I'm not anonymous in Waterloo particularly. Everybody knows who I am and anybody who wants to do anything, or wants money, has my number." He mentioned Waterloo, Toronto and Montreal connections, and though he has not made any investments in Nova Scotia, but the investor had seen deals from Atlantic Canada.

A domain specialist SVC who knew the province well and the various GVC operating in the region conceded, *"I don't know of any groups in Atlantic Canada that we wouldn't want to deal with. I know the general ecosystem in Atlantic Canada."* On the contrary, even though there is not a fund in Canada that does not know the Radian6 and Q1 Labs deals (New Brunswick), a number of the VCs do not reflect on Atlantic Canada as having a vibrant technology space for deals. One ranked the country in order of importance: Ontario, BC, Quebec, Alberta and the rest of Canada is fifth. *"I spend a day a month in Vancouver, I live in Toronto, Montreal once a month, Calgary twice a year. Teams from here going to the east coast might take place once a year. I have yet to make a trip to Saskatchewan or Manitoba."*

Valuation

In a normal functioning market, the various perturbations of the supply of entrepreneurial equity, and the demand for premium high quality equity by VCs, determines the price. The price, in venture capital vernacular, is referred to as the valuation. If there is an abundance of venture capital demanding to buy the entrepreneurial equity, venture capitalists would jostle cheek by jowl (well maybe not literally) for the opportunity to purchase equity in the founders' firms. This is characterized as a sellers' market (favouring the entrepreneurs) and we would expect the valuation of the firms to be high. This situation benefits the founders.

On the other hand, if there is only a small amount of venture capital demanding to purchase a great supply of entrepreneurial equity, there is more supply than demand and we would expect prices to fall. Entrepreneurs want venture capitalists to purchase their equity, but because there are few VCs, they are able to purchase equity from the best entrepreneurs yet keep the valuations low. This is characterized as a buyers' market and favours the VCs. This is expensive for founders.

Founders in the local region of study think that valuations are lower than major cities. Valuations are often a bone of contention as admitted by almost all participants. Many of the SVCs valuation considerations revolved about the founders, the depth of their capabilities and how they should handle lower valuations. SVCs think founders spend too much time talking about valuation, whereas discussions about strategy are the more important discussions. An investor focussed on Series A investments remarked that the first thing entrepreneurs needed to do was to get *"in front of the best investors and get the best deal."* The best deal could mean selecting the partner with the higher valuation, or securing a better partner with a lower valuation. This investor noted the risk of a down round if the

valuation starts too high. If valuations were too high, the next investors can decrease the valuation and then the founder's company gets the stigma of a "problem company and the company is then viewed through a negative lens." This is usually not productive for the company.

One SVC articulated that valuations in Canada are based on a checklist of qualities that a founder accumulates; according to this respondent each quality adds another \$250,000 - \$500,000 to the founder's valuation. Higher margins, recurring revenues, highly profitable revenue streams, multiple products that provide stability, an experienced team with two serial entrepreneurs, and lower fixed costs are all the qualities that contribute to higher valuations. For every one of those boxes that are checked, the investor is paying for a higher valuation.

Another respondent reasoned that if a founder has a prototype, can sell the vision, and articulate the problem that their product is solving, their firm is valued at \$1 million in Atlantic Canada. Whereas, if the same firm were in Silicon Valley, it would likely be valued at \$3 million. He reasoned that when there are so many other firms vying for funding there are more high ability entrepreneurs just due to sheer numbers and that the better ones will be valued higher. Another explained that in Canada, the median valuations are \$2.5 million for angel groups. That includes validated product and validated business model, sales traction and some evidence of sales. If receiving a sufficiently high valuation is a problem for a company they should raise convertible debentures and offer a big discount.

A Series A SVC said the region is less of a focus for the VC industry and there are fewer entrepreneurs and less capital available so valuations are low. "The stats would probably show there is a discount on valuation in the region." He quickly noted, "However, if Jevon MacDonald or Marcel (LeBrun) wanted to raise a company and it was based in Fredericton or Halifax, no one would care. There would be a lineup of people wanting to get into the deal. It wouldn't matter if it was San Francisco valuations or Atlantic Canada valuations."

A New England angel group's rationale about valuations was similarly rooted in the VC/entrepreneur marketplace dynamics. The respondent noted particularly, "When you have a huge supply of start-ups and only a little bit of funding to fund them ... If Ross Findlay's group is the only one there to finance it then they're largely determining the economics of the deal, the valuation, the liquidation preference, and things of that nature. In Boston, where there are 100 VC funds and a dozen business angel groups, and you've got a really good company, the competition for that deal is going to put the power in the hands of the CEO of the start-up because he is going to have competing term sheets and he can turn up the valuation till the market will stop bearing it."

A life sciences SVC said all entrepreneurs think their company is undervalued; there is a general consensus that Canadian companies are valued lower than the U.S. companies that they believe are their equivalents. He succinctly put this notion to rest. He pointed out that the U.S. so-called company "peer" will have:

- Likely raised three times as much money already from angels or economic development corporations;
- Done better clinical work because they have had access to more money;
- Tended to have run fuller clinical programs.
- Tended to do more analytical work at a pre-clinical level; and
- Tended to have done much better bench science.
- More deeply protected IP and more clearly thought through, and
- The management team of the U.S. company will be deeper and broader than the Canadian "so-called" peer equivalent.
- Furthermore, it is more likely that the key entrepreneurs in the U.S. firms will have come out of industry and will have deep domain expertise which – it was observed – was less likely for Canadian entrepreneurs in health care and life science spaces.

This SVC says that the U.S. firm has done all the things "that underpin true value ... If it weren't true and valuations were so much lower on the east coast, the east coast would have no problem funding every single company that it has in its portfolio. If I could get the same thing for less, I would do that. But I'm not getting the same thing for less, I'm getting something else."

A number of SVCs adopted the go-get-it approach whereby founders vigorously pursue the best options for themselves. "If that means going to the Valley, then go." It is of little value for a founder to complain about valuations in Silicon Valley if that money is not available to her. "It's about creating category winners and break-out successes. And usually the sort of slicing and dicing of ownership that happens at the early stages of valuations ... if you're successful in your ultimate mission then everyone's going to do fine. Sometimes I think in Canada that we've had so few big wins, so few inspirational successes, that people focus on what they see around them which are seed rounds and Series A rounds which are really just points in time."

Actual GVC Valuations

The previous sub-section considered the comments by SVCs and the methods, means and advice regarding valuations in general. This sub-section considers some GVC's actual investment valuations. Differences over valuations is the most common reason for potential investment financings to fail.

Table 1 - Mean of Pre-Money Valuation indicates the mean valuation for firms in each of the previous time periods. Since 2003 the mean pre-money valuations have been trending downwards. In 1999 – 2003, pre-money valuations were \$6.6 million, falling to \$5.3 million in 2004 – 2008. The age of the firms is not known which may reflect on the valuation if in earlier years, a greater proportion of more mature firms were available for investment.

Table 1 - Mean of Pre-Money Valuation

Five-Year Span of Activity	N	Minimum	Maximum	Mean
2009 - 2013 Pre-Money Valuation (\$)	22	1,220,588	6,500,000	2,923,853
2004 - 2008 Pre-Money Valuation (\$)	8	456,818	11,919,688	5,260,158
1999 -2003 Pre-Money Valuation (\$)	12	750,000	24,700,000	6,632,278
Pre 1998 Pre-Money Valuation (\$)	4	266667	450000	379,166

For the most recent period, the average pre-money valuation was \$2.923 million. It is not possible to tell whether GVC valuations are significantly lower than other regions in the U.S. or Canada. However, Canadian SVCs' earlier comments about average Canadian valuations seems to be in sync with GVC valuations. GVC valuations do not appear to be significantly lower. Indeed, a number of \$8 million, and \$11 million pre-money valuations took place in the years leading up to the world financial crises in 2008. Not all new investments noted in each period, however, have been assigned a valuation.

Use of Liquidation Preferences

SVCs have found ways to deal successfully with differences in opinion about valuation if it appears that it will be a deal breaker. A logical and fair method to bridge valuation gaps is the liquidation preference. Liquidation preferences are options for a SVC if there are differences of opinion about the company's value. With the introduction of a liquidation preference, the original SVC investment is secured if a liquidation event occurs. It is based on the notion that *"real money in should be real money out - first."* *"It is unfair for the entrepreneur to walk away with millions of dollars and for the investors not to have made a reasonable return, or to have actually lost money"* noted a U.S. VC.

In a liquidation preference example, a VC places a \$500,000 investment in a firm valued at \$5 million taking approximately 9 percent of the company (\$500,000/\$5,500,000). If the firm is later acquired for \$30 million, the liquidation preference returns the VC's \$500,000 first, and then the remaining proceeds are distributed according to the ownership and type of participation. In this example, the VC first receives their \$500,000 (the return of their investment at liquidation) and then nine percent of the remaining \$29,500,000 (if fully participating) for a total

of \$3.155 million (\$2,655,000 + \$500,000) which is 5.3 times the VCs investment (531% return).

In an awkward situation, it is possible for the VC to lose money, but for the entrepreneur to have a very good return. This may happen if the same company in the previous example sold for \$2,500,000 instead of \$30,000,000. In this example, (a real example) the VC placed a \$500,000 investment with a firm valued at a pre-money valuation of \$5 million (without a liquidation preference). Later the company was acquired for only \$2.5 million dollars. In this situation, without a liquidation preference, the VC received \$225,000 (9 percent of \$2.5 million) and lost more than half of their investment (they invested \$500,000 but only received \$225,000). *“The entrepreneur walked away with a \$2.275 million payday.”* The VC lost money, but the entrepreneur was extremely successful. Hence the liquidation preference is used here as a hedge against a valuation for which a VC may feel uncomfortable.

Most recently, the GVC’s activities with respect to liquidation preferences align with the motives outlined by the comments of other seed investors above. In *Table 2 - GVC Liquidation Preference by Pre Money Valuation*, the most recent period’s liquidation preferences can be seen to be applied to investees with much higher mean valuations (2009 – 2013). The liquidation preferences are applied to investees with a mean pre-money valuation of \$4.387 million whereas those without a liquidation preference have a mean pre-money valuation of \$1.911 million. These do not include investments where no valuation was established at the outset.

Table 2 - GVC Liquidation Preference by Pre Money Valuation

Five-Year Span of Activity	Liquidation Preference		Pre Money Valuation (\$) Mean
		n	
2009 - 2013	No	13 ¹	1,910,522
	Yes	9	4,387,555 ²
2004 - 2008	No	3	7,837,633
	Yes	5	3,713,673
1999 -2003	No	10	7,178,734
	Yes	2	3,900,000

¹ An outlier and is removed from the investment data for the 2009 – 2013 sample

² *** Significant p < .01

In a similar vein, the size of the GVC investments is tied to an inclination towards liquidation preferences as well. *Table 3 - GVC Liquidation Preference by Investment Size* demonstrates the larger investments undertaken on behalf of the region are protected from eroding liquidation acquisitions by liquidation preferences. In the most recent history, 2009 – 2013, GVC has included liquidation preferences where larger investment sums were involved. Some liquidation preferences can be used to indicate a return of two or three times the initial investment, but this is not the case with GVC data which issued liquidation preferences at one times the investment only.

Table 3 - GVC Liquidation Preference by Investment Size

Five-Year Span of Activity	Liquidation Preference		Investment Mean (\$)
		N	
2009 - 2013 ³	No	14	264,285
	Yes	18	483,844 ⁴
2004 - 2008	No	3	186,166
	Yes	21	281,919
1999 -2003	No	14	135,773
	Yes	15	248,656
Pre 1998	No	5	240,000
	Yes	11	231,636

GVC Industry Skill Set

The remarks made about the skills sets of the GVC and the professional community are the subject of this sub-section. Rivalry is discussed amongst the larger and smaller firms across national borders, and a rivalry amongst early stage funds which is contrary to later stage funds, is noted as anti-productive. There were challenges by some SVCs with respect to board composition conducted by GVC whereby boards were seen to be too parochial. Lastly, the contracts for early stage companies were seen to be excessively burdensome and costly.

Cross Border Deals: SVCs indicate that there is more sharing of information amongst later stages funds. The necessity to build relationships and syndicate amongst one another is fundamental and essential, particularly where domain specialization is

³ LightSail is an outlier and is removed from the investment data for the 2009 – 2013 sample

⁴ ** Significant p < .05

predominant. The wider SVC community is considered very “clubby” with substantial industry knowledge shared amongst fellow insiders. *“Everyone knows everyone more or less, and everyone talks to one another” “VCs working together, rather than against one another, enhances exits. It improve terms and everyone gets a piece of a variety of deals.”*

SVC indicate that the Canadian industry’s dwindling number of funds presents less competition. This less competitive environment is manifest in deals taking longer to conclude which is not a favourable condition for the industry. In the U.S., *“there is less of a fear of an opportunity getting scooped away from you by other competing investors is lower ... For the Canadian scene to move forward there has to be more intense competition amongst investors to find great deals. More players in the market would help for the chase to the deal.”* There is slack in the Canadian venture capital industry and the brimming U.S. presence is beginning to make itself felt. Increasingly, said a larger fund investor, numerous American firms are prepared to cross the border for the right deal. *“If a Tier 1 firm out of the U.S. wants to do a deal in Canada, even the larger Canadian firms probably do not stand a chance.”*

The somewhat relaxed competitive rivalry does not exist for seed and early stage funds. GVC operating geographically-focussed seed and early stage funds indicate that there is not a great deal of discussion amongst local fund managers. One investor reported that the local GVCs stay in their niche. They have to because they cannot cross borders. Said one local non-GVC investor, *“We talk to them because we have to, but they do not have to talk to us. The territorial interprovincial bantering about VCs and accelerators stealing one another’s entrepreneurs is just starting to stop.”* Recently, a cooperative effort to develop syndication relationship-building took place amongst non-government and GVC funds, and the shared event was well received by SVCs though not well-attended.

SVC investors report that there is a sense of intense competition and a natural rivalry amongst early stage investors unless an entrepreneur forces two funds together. Said a SVC from a larger fund, *“In Canada, I’ve been sitting at the same table at a conference with people I know and they’re super guarded about what they looking at and what they’re interested in, and it’s sort of fascinating to me.”*

Creating Boards of Directors: Helping the founder create a board is an important role for the venture capital industry. SVCs complain that boards are not as sophisticated as they ought to be in the Canadian GVC industry (as well as within the junior public equity space). Building good boards is challenging because the people who are recruited assume high workloads. Domain-focused SVCs (rather than generalists GVCs) have an advantage in selecting boards because they need to travel further afield to find their deals and the partners necessary to bring the right team and syndicate together. The effort produces knowledge of experts for boards. In order to develop relationships to identify the best syndicating partners, domain experts constantly manage networks cultivated from a very diverse group of

Americans and Canadians which helps them create expert specialist board members.

Domain experience is an asset on a board and is provided by someone with experience in selling into the firms’ key markets. These domain specialists understand the key people in the market, the sales process (not technical), how the technology can be applied, and how to most effectively speak to potential sales partners and customers. An effective domain director will ideally have the proverbial Rolodex (numerous well-connected contacts) as well. A properly functioning board member need to give time to the firm, not just their names and biography. Unfortunately such members are difficult to find.

SVCs noted that board composition practices of some of the GVCs are parochial. *“From an early stage perspective, the two problems that you would have are: founders that want to be protective and so they try to have board members who are friends to them as opposed to being completely objective; or, venture capital firms that don’t have a whole lot of experience and may not think about trying to attract the best. Take ... or ..., my sense is they don’t go out of their way to try to attract the best people wherever they are – I just haven’t seen that with them. I think those are the two issues that exist in the region.”*

Concerns are expressed that boards are not sufficiently broad-based, geographically or industry-wise, and that persons with intelligent insight into the key markets are missing. The company, hampered by poor board selection, suffers under bad governance. Boards can micro manage firms and meddle in situations causing later down rounds. *“Governance issues arise when populating a board if I have one of these angel guys, one of these government guys, one of these private investors who does not have a lot of knowledge, now I have two thirds of the board who are not productive towards the long term goals of the company.”* Having dealt with such a situation, an SVC remarked that these circumstances did not cloud his interest in the region; it simply caused him to search for these potential problems in advance.

Other SVCs focussed on contracting details that were too complex, lengthy and expensive. One example was the documentation prepared by professionals which was excessive based on the size and stage of the company, and more suitable for a large publicly traded firm. The respondent indicated that this over-papering of a deal was likely the result of a professional advisor trying to use standardized documentation; they *“pulled all the terms and conditions and applied them to an early stage firm.”* The SVC estimated the documentation would have been indefensible regardless because the entrepreneurial firm did not have enough money to even have the documents read should any action have taken place. The local professional community and GVCs were further indicted for other problems such as the length of the documentation (90 pages), length of time to acquire documentation (twice as long as it should have taken), the lengths to which professional support were sought (legal firms that are thousands of miles away), and the amount it ultimately cost (twice as much).

Generalists (GVC) and Domain Specialists (SVC)

This section investigates the candid SVC comments regarding movement of financing from generalists (GVC) to domain specialists (SVC) and the types of syndication partners that are preferred. Founders' firms move from generalist venture capital funds to domain specialist funds as their financing needs grow. As a founder firm matures, and its capital and mentorship needs expand, the requirement for more specialized financial talent takes the search for venture capital out of the investee's region. Larger venture capital industry funds, more sophisticated domain specialists, or companies that are in the investees' market or industry, understand what the investee is doing better than a generalist.

Responding participants indicated that GVC fund managers were principally generalists because they are geographically focussed and cannot move outside their geography. *"Categorically, if you have local investors who have never invested outside of a geography, they are heads down and myopic to the rest of the world. And so their network is what it is. They understand their small pond very well."* They have to, it is their role. Hence, it is difficult for these generalists to know the specifics of some technologies. A generalist, because they do not fully know the capacity of every innovation, necessarily prices entrepreneurial offerings lower than specialists. Deal terms can become very specific to a region.

As the venture capital industry moves upmarket, so does its sophistication. Various SVC funds gather domain specialties usually based on the backgrounds of their GPs and staff. One fund has five PhDs, a MD, and two others who have been in this industry for two decades. Furthermore, all of these individuals have backgrounds in operating companies and none came out of *"a finance degree into the VC industry."* This trend out of the U.S. is changing the Canadian industry as well; the make-up of the fund managers is much more mimicking the U.S. model.

When an investee finds an investment fund that understands what the technology can do and understands the founder's vision and the specifics of the market, the investee and its local VCs have found what the industry refers to as *smart money*. A SVC quipped: *"...in these instances, the founder does not have to tell the investor what the product will do – the investor will tell the founder what the product can do."* One SVC noted that eventually founders need specialists who can: help the CEO get close to a potential customer; have someone to help them if they need to talk to someone in California; have a tie to someone who can make that connection; help tease out human resource issues; find talent; and spend time with the CEO. These can be all separate individuals requiring the syndicate's fund partners to have myriad resources to draw upon.

Alignment of Motives and Stages for Syndicating Partners

SVC have a variety of operational knowledge and strategic qualities that make them sought after by GVC. These qualities typically involve similar motivations and fund values, the network of relationships that they bring to the syndicate for potential

exit partners and to add value with the entrepreneur, capabilities with hiring talent if necessary, and their ability to provide follow-on financing as the firm matures.

Syndicates gather around a specific investment mentality - never go into an investment alone. The simple rule is that the more deal syndication involved the more validation it provides for the SVC. One VC noted, *"I never go alone, I don't believe in it. It's a sobriety test for me. If no one else is interested chances are I've missed something."* Some funds syndicate on every deal, and are the lead architects of every syndicate they participate in. Amongst these, there are a variety of *"sweet spots,"* with most of them varying around the revenue status of the firm (i.e. just pre-revenue, post-revenue, etc.). Alternatively, a few smaller and seed funds that were interviewed, including an American fund, operate differently; they always syndicate but never lead. Sometimes they are aligned more closely with the founders rather than the future syndicating partners. As seed funds, one investor indicated they often opt out at the Series A level where syndicators need to be harnessed.

One of the largest funds that participated in the interviews indicated that they are sought after for syndication about half of the time, and the other half of the time they are soliciting syndications. In particular, the interviewee noted, large funds writing large cheques and participating in large deals definitely seek participation from *"far more sophisticated investors from south of the border."* He noted as an example, large infrastructure deals where a partner is sought that knows big processes, or plant-type businesses, or has expertise related to infrastructure investments for further fund raising; they look for parties who have other partners, relationships, good optics for a particular deal, or specific contracting experience. Having conversations outside Canada was critical to achieving these partnerships. If the relationships are not built on several previous trials or attempts, they may not be there for you when you need them on a later deal. More capital is always better than less, and strong relationships with capital providers is critical to securing funds when necessary.

SVC stress the similar values that must be shared amongst syndicating partners. The selection of a syndicating partner needs to ensure the alignment of motivations and values such as whether or not they are management friendly or will they hold managements' feet to the fire? A \$200-million fund investor is interested in smart partners who have domain expertise. He said:

"What I'm really looking for is who the partner on the deal is going to be. Is that partner smart, and is he accretive to our totally syndicate strategy. Does that partner have skill set, an aptitude, an experience base, a set of contact numbers or relationships that are incremental to those that we feel already exist in the syndicate that has been architected. We will very rarely bring a partner to a syndicate that's just dumb money. We might if it was a small amount. But that's not what we're looking for. We're looking for partners who are smart, they know what they're doing, who have domain expertise and they have capital to follow-on so that they can ride the continuum of the company with us, and not force us to make decisions that

are not aligned with how we see value creation. And they share our vision of what value creation looks like. We have to be very careful when we syndicate that we invest with people who have the same end points and objectives as us.

Most of All, It Is the Person

The alignment of motives, stages, and series of investment are all objectives being sought by VCs for syndication. More than that, however, VCs like doing deals with the same person whenever they can. This predilection was repeated over and over in a variety of different anecdotes about their syndication preferences. Three vignettes describe these interests pursued by SVCs.

An SVC from a fund with numerous recent exits prefers to syndicate with repeat partners from previous deals. His fund knows the partner well, they know what they are strong at, they know what they are weak at, they know their style, and they know how the other VC (GVC or SVC) interacts with management. Knowing these elements in advance, by working with repeat partners, reduces the risk in the syndicating partner selection decision process because of the timelines which need to be adhered to for typical funds.

A domain specialist SVC who happened to know the locale and the GVC industry well said, *"I would syndicate with people we have worked with before. And I can say to guys, 'You are going to love these guys, they bring real value to the table.' ... we're different because we've been doing it long enough. We like to cut with our own friends."*

An American SVC recognized that his domain specialty came from his considerable expertise as a founder. He took a derisive attitude about SVC fund managers who, as professional intermediaries, invest other peoples' money and who want to raise larger and larger funds for greater prestige. As a job, their role is to make a good return for their LPs, but in sum it is a job for them. His thrill of the hunt is to make money from his own money and to provide *smart money* in the process. He has syndicated with OMERS and Sequoia, but the entrepreneur is usually the architect who wants him on the deal. His value to the founders and the large well-known funds is his background in business. Having started a business from zero and growing it to \$ 2 billion has given him experience and troubleshooting capability that *"professional VCs"* alone cannot provide.

The importance of repeated relationships with specific people is evident in various successful start-ups, investments, syndications and exits by a collection of individuals in the region. The co-mingling – over more than a decade -- of the personalities associated amongst a corporate entity, a high performing growing firms, several smaller entrepreneurial firms, several successful exits, an IPO, an investment club, and a small number of VCs could challenge a good anthropologist.

Over a decade many of the same names have reappeared on boards, in syndicates and in the ventures themselves.

Trends Affecting Syndicating Partners

The track record for raising new funds in Canada is dismal. Fundraisings are down for private independent funds by 51 percent year over year, and down 24 percent for the industry as a whole (2014). Even the *successful* independent funds are having trouble raising new money. This is particularly troublesome for the east because the fewer funds there are in Canada as a whole, the fewer SVC there are for future financings for GVC. A specific number of funds which were particularly favourable to the local area are having fundraising difficulties. Even a small \$500,000,000 fund could not be raised by a very successful group of VCs. *"These were highly successful people with small shops of only three to five persons."* The inability of SVC that were once friendly to the region to raise new funds is a loss to the region. *"Previously, there had been some success with mid- to small-size funds where the individuals have a good track record of supporting their investments. But there are very not that many of them left. It's a very sad day,"* noted one investor.

A few super angels in the region have established funds but they are not ICT, life sciences, clean tech, or ocean tech focused. These newer funds are more private equity-based and are investing in up-market firms (more mature with earnings) in traditional industries because that is what their LPs know. There was some excitement when a very large SVC established a new fund and had articulated an objective to invest down-market into more seed and pre-revenue companies. *"They made one investment and then went up-market again to more private equity deals because the returns were looking much better."*

Look to the U.S.

Though fundraising opportunities are declining in Canada, they are increasing in the U.S. (Veghte and Herman 2014) where the rate of fund raising is experiencing heated activity. These trends indicate we must increasingly look to the U.S. for future syndicating opportunities⁵. Fortunately, U.S. funds suggest the Canadian market is ripe for syndication consideration.

The leadership of one of the 23 different business angel groups in New England said their group had raised five funds to date and though they have never been approached to invest in the regions' by the GVC, they appear to be willing to consider Canadian possibilities. The New England BAN noted their sweet spot was just pre-revenue. They had two approaches when seeking their own syndicators. If a deal was seeking to raise \$1,000,000 - \$1,500,000 they had several "pre-existing relationships with SVC regular angel groups that they approach who like to work with to fill out a round. When founders need \$2,500,000 - \$3,000,000, the angel

⁵ Fundraisings are down for private independent funds by 51 percent year over year, and down 24 percent for the industry as a whole. Even the *successful* independent funds are having trouble raising new money.

group goes to the broader set of SVC in New England that are beyond their regular familiar syndicating partners. They have a regular presentation, screening and selection process that takes place twice annually for these larger deals. The many BAN in New England have developed a Due Diligence Treaty to enhance their trust and cooperation.

The U.S. National Capital Association has two initiatives to create broad syndication participation in clean tech and life sciences. Founders who cannot raise enough funds for more expensive deals can access national participation by BAN syndicating from across the U.S. This most recent development of a national business angel syndication structure might encourage them to look at Canadian investments because:

- The real lack of capital for Canadian firms suggests their angel network will find better opportunities;
- They expect that there are more reasonable valuations than in the current red hot Massachusetts market; and
- The Canadian governments' support for entrepreneurship is better than in Massachusetts where there is no governmental support for entrepreneurship.

GVC Syndication

The need for the GVC is crucial precisely because trends in the industry are tending to move up-market, post-revenue, and toward more central and urban areas. "... Federal funds don't like pre-revenue. It is very hard to get any SVC from out of the region to invest in a company pre-revenue." "It (GVC) adds a lot of ingredients into the ecosystem and I view these funds as absolutely critical ... are far less critical in Boston, or New York, or San Francisco."

The ability of the GVC to syndicate with partners outside of their own kind indicates the enthusiasm that SVC share in the investment climate in the east coast. *Table 4 – Number of Syndicating Investors* examines the objective data of the GVC's syndication partners over the pre-defined periods. Over the three dominant five-year periods of GVC history in the data, 41.2 to 45.8 percent of the total number of investments were syndicated (barring the pre-1998 group). Looking specifically at the most recent of the five-year periods, the proportion of investments with syndicating partners is approximately 41.2 percent. A couple of investments included two and three other co-investors and one had four syndicating investors in the financing. The slowdown in syndication activity between 2004-2008 and 2009-2014 may have been a result of the rapid increase in investment activity over the two periods (from 24 investments to 34 investments).

Sixteen different SVCs were a part of the 39 deals syndicated since 1998. Troublingly, three of the 16 different syndicators are no longer in existence. A review of the various SVCs concluded that GVC organizations co-invested only on

five of the 39 syndicated investments. In each of these occasions, there were other SVCs in the financing. At least four of the financings had corporate partners as part of the syndicate.

Table 4 – Number of Syndicating Investors

Five-Year Span of Activity		Frequency	Valid Percent
2009 - 2013	GVC	20	58.8
	One Syndicating Investor	10	29.4
	Two Syndicating Investors	1	2.9
	Three Syndicating Investors	3	8.8
	Total	34	100.0
2004 - 2008	GVC	13	54.2
	One Syndicating Investor	7	29.2
	Two Syndicating Investors	2	8.3
	Three Syndicating Investors	2	8.3
	Total	24	100.0
1999 -2003	GVC	16	55.2
	One Syndicating Investor	7	24.1
	Two Syndicating Investors	4	13.8
	Three Syndicating Investors	2	6.9
	Total	29	100.0
Pre 1998	GVC	16	94.1
	Two Syndicating Investors	1	5.9
	Total	17	100.0

The sum of GVC funds invested over the four periods, \$31,897,005, is part of total investments of \$92,086,924. The GVC investments have been leveraged by additional syndication of \$60,189,919.

Table 5 - Amount and Rate of GVC Syndication outlines the additional syndication participation with GVC investments. In the most recent period, every dollar invested by GVC raised an additional \$1.77 for a total of \$2.77 invested in local founders. In 2004 – 2008, 2.88 times investment was raised, and the previous period raised 4.43 times the GVC investments. In total, the additional \$60.189 million invested in local founders was raised from SVC outside the region.

Table 5 - Amount and Rate of GVC Syndication

Five-Year Span of Activity		N	Sum
2009 - 2014	GVC Investment (\$)	34	14,526,749
	Total Raise (\$)		40,424,912
	Times Investment Raised		2.77 X
2004 - 2008	GVC Investment (\$)	24	6,478,804
	Total Raise (\$)		18,454,239
	Times Investment Raised		2.85 X
1999 -2003	GVC Investment (\$)	29	5,630,672
	Total Raise (\$)		24,946,994
	Times Investment Raised		4.43 X
Pre 1998	GVC Investment (\$)	17	3,760,779
	Total Raise (\$)		4,260,779
	Times Investment Raised		1.13 X

Discussion

This research sought to explore the perceptions of local and regional GVCs from the vantage point of potential syndicating venture capitalists. The in-depth interviews with national and international SVCs were combined with data from local GVCs from the Canadian east coast. The rich narrative from the SVCs themselves represents a candid and forthright contribution that adds to the received research to date. Their voice and their brusqueness is vivid.

The discussion draws attention to the need for GVC because of the lack of other available potential syndicating relationships with VCs from outside the region and increasingly outside the country. The nature of the VC asset class is such that without highly qualified local VCs to identify, introduce and monitor founding firms, the potential for syndication is severely curtailed. Syndicators are most likely more specialized domain expertise and are further afield. They will only be introduced to the area if they have local and GVC and VC to provide oversight.

If they wish to be funded in their own locales, founders and their initial investors, friends and family need to work with locally-backed seed and early-stage funds because more formal venture capital funds (larger traditional structures with LPs and institutional funding) have little appetite to syndicate with pre-revenue founders.

Information economics (Akerlof 1970) would suggest that because SVC are industry specific or have domain experience, they have the knowledge and talent to understand the specifics of a technology, can make accurate valuation assessment and can value deals higher. Domain experience is knowledge, experience, and competence in a specific market or industry. A generalist GVC may not fully appreciate how capable is an industry-specific founder's product because the GVC does not have specific domain experience. Therefore, generalist GVCs have less ability to make an accurate assessment and tend to keep valuations low.

Unintentionally, keeping valuations low has the perverse effect of driving away the best founders, those who can go elsewhere for finance, or who can redirect their efforts, or who can postpone their activities until other finance becomes available. Deliberately or inadvertently driving down valuations often leaves the weakest and the least competent founders as the remaining candidate pool. Less capable founders have fewer other options and are willing to accept poorer terms (i.e. lower valuations).

Comments by SVC are aligned with this hypothesis. Moreover, some local founders have balked at the valuations suggested by local funds and have bootstrapped their way to successful exit, or gone to major cities in the U.S. and Canada for finance. In these cases, GVC have lost out on potentially profitable investments and exits. This, of course, happens to every VC. It was noted that *"every good VC does a retrospective analysis every year to investigate the ones that got away. What was on their A list and where are they now? In reality, we see 500 deals a year and we only do five."* Valuations as presented by SVCs seemed in concert with the valuations indicated by the 105-case GVC database.

The proclivity of GVCs to pursue strategies adopted by other seed stage and growth investors infer the professionalization of the GVC investment managers and their protection of the publics' funds similar to strategies used by SVC. The inclinations indicated by liquidation preferences indicate GVC practices that protect the investment when valuations are uncertain.

The qualities sought of syndicating partners include alignment of motivations, increasing domain expertise, and SVC capable of pursuing follow-on financing as founders' firms mature. Most of all, SVCs are concerned about conducting transactions with individuals they like to work with and who bring value to the syndicate. Often SVC have a small number of other SVC they go to with syndicating opportunities. Relationship-building is paramount and individual personalities, capabilities and methods are important.

As the preference for specific partners is carried throughout a SVC career and subsequent funds they raise, it suggests that the number of different persons with whom they will do business will (proportionate to the number of deals they do) shrink over time. Therefore, local GVCs will want to source good deals to bring in good syndicators to ensure a repeated series of successful syndications over time.

To do so the VCs must be high value-added contributors themselves. More skilful venture capitalists will have superior sources for deals (Amit et al., 1998) which exposes them to opportunities to produce superior returns. Improving one's investing skill promotes reputation capital and subsequent potential for future syndication (Lockett & Wright, 2001).

The local GVC funds' database demonstrate indicate a good proportion of syndicating relationships in the investments made over the past two decades. In the most recent periods, they have been able to almost triple the amount of investments they have placed, bringing in funds at a rate of and additional \$1.77 for every dollar they invest. Sadly, the Canadian industry is flagging and three of the SVCs that GVC formerly participated are no longer in the industry. More vigilance by GVC will be required to sustain the entrepreneurial ecosystem that the region has begun to rely upon for innovation.

In a perfect world, a local VC finds high performing entrepreneurs from whom to purchase equity and the local VCs then invite others to share in the deal. The syndicating partners do not have to be within geographic proximity to the entrepreneur because they rely on the local GVC to assume the responsibility of providing oversight. GVCs invite potential syndicators into deals because they want to distribute risk and the domain expertise of the SVC will add value. But they also invite SVC to participate in hopes that they will return the favour - that the SVC will invite a GVC to syndicate on one of their transactions in the future. Reciprocity is highly implicated in syndication and trusting (Wright and Lockett, 2003) that a SVC will not act on another's information gathering continues the good standing of an SVC in the industry (Anand & Galetovic, 2000).

AGVC who is soliciting other syndicating VCs (the architect of the deal), can invite any other VC in the world to syndicate with them. Given a highly valuable entrepreneur, a generalist GVC, can select one or two, or three, of the most highly specialized VCs in the world to participate in a deal. With a valuable founder, the potential for syndication is almost limitless.

This is not a perfect world, however. The ability to access, assess, and mentor high performing entrepreneurs can be elusive. Moreover, if SVC like to do business with people with whom they have done business with before, then in reality, the potential billions of dollars in the rest of Canada, the US, Europe and beyond, are largely beyond the grasp of a regional locale.

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Dr. Ellen Farrell

Weak Ties and Global Reach:

Network Theory and the Atlantic Entrepreneurial Ecosystem

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**WEAK TIES AND GLOBAL REACH: NETWORK
THEORY AND THE ATLANTIC ENTREPRENEURIAL
ECOSYSTEM**

ABSTRACT

Interest in entrepreneurial ecosystems has intensified with the acceleration of the importance of entrepreneurship to the creation of successful economies. The discussion has principally focussed on historical and ethnographic accounts of the interactions of personalities, events, actions of various companies, the recycling of talent, and the composition of a variety of different types of actors and groups in the ecosystem. The research outlined here responds to the need to study the complex dynamics of differing ecosystems, their context, and institutional characteristics (Audio, Kenney et al., 2014). Here, the knowledge-seeking behaviours of ecosystem participants are measured and mapped using network theory. The knowledge-seeking actions are the unit of measurement. The work also draws on the sociological literature of ‘weak ties’ and clusters of innovation. The results demonstrate a highly quantitative method of charting the dynamics of an entrepreneurial ecosystem, yet so visually arresting as to appeal to the most cynical policy maker.

Keywords: Innovation; entrepreneurial ecosystem; cluster; network theory; entrepreneur

INTRODUCTION

Entrepreneurship is the conduit to success attributed to specific locations such as Israel, Silicon Valley, and Route 128 as examples (Saxenian 1994). More recently, entrepreneurship is recognized as accelerant for the specific strategies adopted for the strategic management of locales, regions and places (Audretsch 2015). Underlying this success is the curiosity of individuals, their desire to expand their knowledge to increase their propensity to innovate and enterprise, combined with numerous other tangible and intangible supports. Concentrated systems of entrepreneurial innovation in specific regions has spawned the terminology of entrepreneurial ecosystems (Bahrami and Evans 1995) and clusters of innovation (Bresnahan, Gambardella et al. 2001). The term entrepreneurial ecosystem goes back beyond 1995 where the most famous entrepreneurial ecosystem in the world, Silicon Valley, was characterized by “fleeting opportunities, shifting customer preferences, cascades of technological innovations, brutally short product life cycles, and furious global competition” (Bahrami and Evans 1995, p 62).

The purpose of this study is to investigate the relationships amongst the various groups of actors within an entrepreneurial ecosystem. It does so using network theory as its method of analysis and knowledge-seeking activities as the unit of analysis. This work considers a geographically located entrepreneurial ecosystem as its starting point. It seeks to understand the innovation-seeking reach of the ecosystem, its major constituents, and to observe and measure the connectivity and its density within and beyond its geographic borders.

The study responds to the call to study the dynamics of differing entrepreneurial ecosystems and their context (Autio, Kenney et al. 2014) and to use more quantitative approaches (Engel 2015; Overholm 2015). It also sets the stage for measurements of connectivity, density and diversity in a more structured manner (Stangler and Bell-Masterson 2015). This study uses the type, frequency, and importance of knowledge-seeking behaviours as the measure of innovation-seeking activity (Alvarez and Barney 2007). The data is analysed using network theory to map the knowledge-seeking behaviours amongst the constituents of the ecosystem. Network theory demonstrates the distribution of information-seeking activities in a visual and quantitative manner. We conduct this study using an entrepreneurial ecosystem located on the east coast of Canada where the foci are a number of small provinces that are sparsely populated and avoid focus on the firm or the entrepreneur.

Key constituents in the ecosystem are obvious by their rankings. Investigating the types of information sought highlights the curiosity for business versus technical information. Moreover, stripping away various elements of the ecosystem shows the relative importance of various actors. The methodology is a powerful policy tool at a municipal, provincial and federal level as its visual, and highly specific presentation, is informative for key decision makers.

The paper proceeds as follows. It begins with a short description of the entrepreneurial ecosystem under investigation which outlines the AEE’s geographic, political and economic context. The methodology for studying the ecosystem follows including the nature of the analysis, the sampling methodology, the survey protocol and descriptives of the respondents. The next section contains the results, including network charts and tables of measures. The paper concludes with a discussion of the implications, limitations and opportunities for further research.

ENTREPRENEURIAL ECOSYSTEMS

Current interest in entrepreneurial ecosystems has a tendency to place successful ecosystems within their current day context, yet most successful ecosystems have roots well back into the 1940’s and 50’s and beyond. The most successful of some of these regionally-based entrepreneurial undertakings have caused them to be the focus of considerable attention such as Silicon Valley, Route 128 in Massachusetts, Start-up Nation Israel, Silicon Glen in Scotland and Sophia-Antipolis in France to name a few. Some attention has been paid on less-than-successful locales (Honig and Black 2007) as well.

The study of entrepreneurial ecosystems has taken many forms in the extant literature. Ethnographic or historical accounts identify numerous variables associated with cultivating regional advantage such as a combination of community, success, concentrations of university talent, pools of venture capital, and adept abilities to adopt new paradigms (Saxenian 1994) and refer to “visits, interviews and other materials” (Bresnahan, Gambardella et al. 2001, p 825) in their data collection. Constituents contributing to the ecosystem are used to build models illustrating the flow of activities amongst the groups (i.e. Bahrami and Evans 1995; Ferrary and Granovetter 2009). Models of economic entrepreneurial ecosystems have been constructed using expenditure and investment data (i.e. McCann 1997). Autio, Kenney et al. (2014) constructed a framework for investigating entrepreneurial ecosystems within the context of the industry, technology, social policy and organizational context, and related policy concerns, but also considered the temporal and global, national and regional innovation systems. Survey data of location decision measurements such as location decisions (Galbraith, Rodriguez et al. 2008) complements interpretive analysis resulting in theoretically constructed propositions (Honig and Black 2007). A longitudinal analysis of the inventor networks highlighted the emergence of clusters and networks in specific industrial classifications (Ter Wal 2013).

Entrepreneurial ecosystems represent “networks of actors contributing to joint value creation” that had “undertaken some degree of co-innovation or adaptation” (Overholm 2015, p 19). Simultaneously, the evolution of entrepreneurial ecosystems has been buttressed by the emergence and growth of clusters of innovation (Bresnahan, Gambardella et al. 2001). A cluster of innovation is an “environment that favors the creation and development of high potential entrepreneurial ventures, and is characterized by heightened mobility of resources, including people, capital and information” (Engel and del-Palacio 2009). Clusters of innovation have been characterized as local networks strengthened by the prevalence of weak ties which are essential to innovation activities and networks

(Granovetter 2005), but that achieve greater success by extending their reach globally (Engel and del-Palacio 2009). With effort, teasing out the distinction between the two terms is possible; both have elements of co-location and clustering, but are also characterized by far-reaching networks and innovation-search activities. From a generalist's perspective, it appears that the large and successful entrepreneurial ecosystems described in the 90's now seem to be referred to as clusters of innovation.

Role of Knowledge-Seeking in an Ecosystem

In entrepreneurial ecosystems or clusters of innovation, networks of actors cooperate to encourage the entrepreneurial activity in a region. One activity that spurs innovation is the search for information from persons who are casual acquaintances (referred to as weak ties) because new information from casual acquaintances is more likely to be novel and unique than the information derived from close friends and family (Granovetter 1973). In particular, information that crosses boundaries of knowledge, referred to as structural holes can be excellent sources of new innovations (Burt 2004).

Weak ties, necessary for broad information gathering, arise from person-to-person networking, personal inquiries, casual acquaintances, open innovation requests, and other means of 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. Ecosystem participants use the information gathered to enhance the mobility of people, talent, know-how, capital and other tangible and intangible assets. Knowledge-seeking efforts open the founder to complementary competencies and resources to gain access to new knowledge and people. Knowledge-seeking by networking is an active way to create entrepreneurial opportunities for high-tech innovation, and high-tech founders exploit existing opportunities and deploy their networks to form new contacts and relationships that form new opportunities (Moensted 2010).

Multiple and/or increasingly strong connections made between members over the duration of a year simulates the durable bonds defined by Engel and del-Palacio (2009). The increasing strength of weak ties (durable bonds) is represented by ecosystem participants building more reliance upon one another which is suggested if ties are more numerous or more important to the seeker.

Breadth of Knowledge-Seeking

The successful ecosystems and clusters are distinctive in their geographic reach. Whatever their origins, they end up greatly networked; they do not operate as isolated islands. 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 (Bresnahan, Gambardella et al. 2001). "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" (Engel and del-Palacio 2011, 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.

METHODOLOGY

Studying entrepreneurial ecosystems with more quantitative approaches have been encouraged in order to contribute a different lens (Engel 2015; Overholm 2015) to the highly insightful and subtle qualitative observations made by significant scholars in the area. The measure analysed was knowledge-seeking behaviours. A survey of the knowledge-seeking behaviours of constituents of an entrepreneurial ecosystem used a convenience sample of start-ups in the region and continued with a snowball sampling method of firms mentioned in the survey results. To effectively analyse the ecosystem's knowledge-seeking behaviours quantitatively, network theory was employed which permits viewing connectivity, density and diversity of the network. Information about the knowledge-seeking activities included the importance and frequency of the ecosystem's participants' activities. A more detailed description follows with sub sections on the measures, sampling, data collection and descriptives.

Measures

Alvarez and Barney (2007, p 19) noted that the central measure used in the opportunity literature were "actions that entrepreneurs take to form and exploit opportunities." Measuring of an "action" that is to acquire information is congruent with the notion of weak ties as described by Granovetter (1973), and later by Engel and del-Palacio's (2009) durable bonds. So where performance is driven by entrepreneurial innovation which is a function of entrepreneurial behaviour (Autio, Kenney et al. 2014), the curiosity underlying an search for information, is known here as knowledge-seeking behaviours.

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. Three dimensions were investigated regarding each knowledge-seeking activity: importance, frequency and type of information sought. The number of times an ecosystem member reached out was measured indicating weak and developing bonds, and the importance of the information to the seeker was measured with a seven-point Likert scale. The information sought was also assessed as either business/market/ financial information (business processes and management), or product/scientific/ technical information (product development).

Sample Selection

There is no list *per se* of all entrepreneurs or entrepreneurial firms; the research sample was drawn from a list of start-ups within the past 10 years drawn from media sources within the entrepreneurial community of Atlantic Canada. The Atlantic Entrepreneurial Ecosystem (AEE) is situated on the east coast of Canada with four principle hubs (Halifax, Saint John, Fredericton and St. John's) spanning four provinces: Nova Scotia, New Brunswick, Newfoundland and Labrador, and Prince Edward Island. The four provinces compose what is referred to as Atlantic Canada. With approximately three percent of the nation's population, the region suffers difficulties. With a combined population of less than 2 million persons, the Region suffers from a declining birth rate as well as declining population.

Using respondent-driven sampling, respondents indicated persons from whom they sought advice, information, or knowledge about entrepreneurial decisions and innovation. The individuals noted by each respondent become the source for enlarging the sample and developing new potential respondents. The technique of using respondent-driven sampling is appropriate for network analysis (Biernacki, 1981) particularly where the intention is to see how broad the reach of the constituents starting at a prescribed geographic region. Using this method, it was possible to access hidden agents participating in the Entrepreneurial Ecosystem, but not physically located there.

The targeted sample for the AEE began with a base list of 148 qualified potential respondents generated by carefully evaluating personal contacts of the lead researcher, *Entrevestor.com* (an entrepreneurial news service), *AllNovaScotia.com* (a business news service), and the online networking site, *LinkedIn.ca*. As the surveys were returned, which implicated other people and companies as part of their search for information, surveys were sent to those whose emails could be accessed by the researchers.

Data Collection

The survey protocol was executed by means of a "fillable form" survey which was emailed to the sample. Returned surveys with digital data were directly loaded into a database. This type of survey distribution was adopted to avoid services such as Survey Monkey to ensure that the process of exporting data from the surveys occurred on servers owned, and operated, by the University, as opposed to an independent third parties where the information may pass through the United States and therefore subject to possible inspection (2015).

Data from returned surveys, via .pdf fillable forms, was exported to a .csv file and populated the database automatically. Staff manually cleaned and coded the data to avoid duplicate nodes that had misspellings or varying acronyms, and to categorize various differing types of agents (i.e. venture capitalists, entrepreneurs, universities, professionals, government, universities, and corporations). The data were analysed using network theory and the open source software, Gephi (Cherven 2013).

Survey Descriptives

The survey instrument was responded to by 95 individuals (some of whom declined to participate for specific reasons). The survey was completed by 79 respondents. The total number of different individuals noted in the ecosystem was 1268 which related to 781 organizations. A total number of 1474 knowledge-seeking transactions were engaged in by this model of the ecosystem.

The nature of the respondents' capacities within the ecosystem is outlined in Table 1. Most of the respondents were entrepreneurs (46.8%) followed by a class of individuals who reported themselves as consultants (36.7%). As a collection, the next largest group were the venture capitalists (15.2%), and professors from local universities and colleges represented 12.7 percent of the respondents' professions. The private individual investors (10.1%) and a member of an angel network (1.3%). Respondents were permitted to self-identify into more than one category.

Table 1 - Self Identification of Profession

Self Identified as	Percent (%)
Entrepreneur	46.8
Consultant	36.7
Venture capitalist	15.2
Professor	12.7
Private Individual Investor	10.1
Government Representative	3.8
Mentor	3.8
Employee at a large firm	1.3
Bank Representative	1.3
Member of Angel Network	1.3
Lawyer	1.3

Professors aside, the level of education amongst the ecosystem is very high. Respondents were highly educated with all but two having had some form of post-secondary education. Combined, more than half of the respondents had a masters' level or a doctorate and 27.1 percent of the group had a bachelors' degree. Fourteen percent of the respondents had a professional designation. *Table 2 - Level of Education* outlines the educational profiles of the respondents involved.

Table 2 - Level of Education (Excepting Professors)

Level of Education	Percent (%)
High School/Equivalent	2.9
Vocational/Technical School	2.9
Professional Designation	14.3
Bachelor Degree	27.1
Master Degree	42.9
Doctoral Degree	10.0

Figure 1: Entire Ecosystem

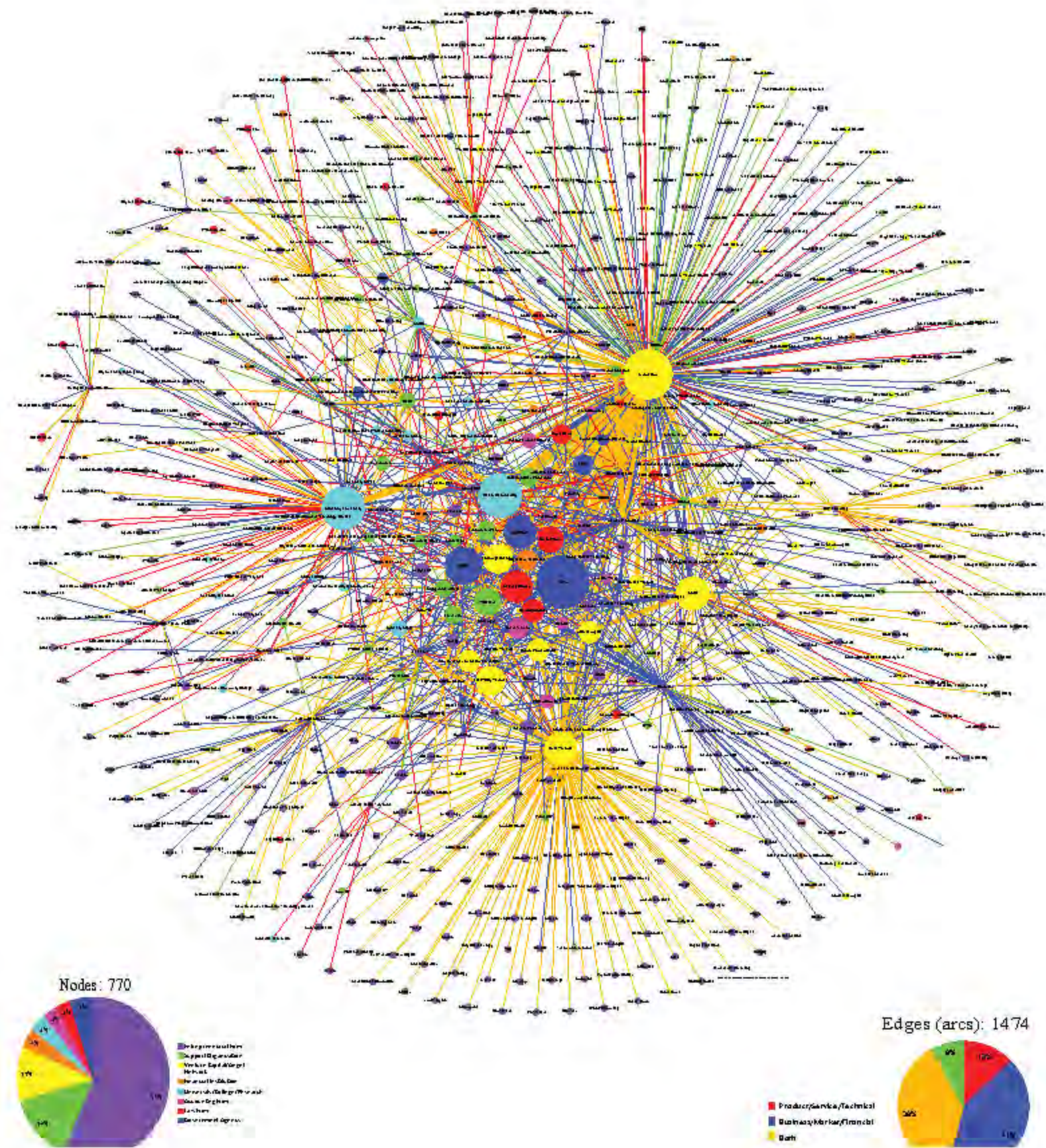
RESULTS

The image of the entire knowledge-seeking activities for the AEE is displayed in Figure 1. The legend for color-coding the various types of constituents is in the lower left corner. In this chart, the size of the node (circles with institutional names noted) represents the number and importance of the knowledge-seeking behaviours which others sought of the named node. The centrality of a node is an indication of its interconnectedness amongst many different information seekers. The arcs (lines between nodes) indicated the type of information sought and the value of the information to the seeker. Close examination of the arcs indicates the direction of the knowledge-seeking role by the pointy end on one end of the arc.

AEE Constituent Groups

The knowledge-seeking activities of the AEE are very complex. There are 781 different organizations represented in the reported AEE and 1474 separate knowledge-seeking relationships defined. Fifty-seven percent (57%) of all of the nodes in the AEE represent firms, both entrepreneurial and corporate. The next largest group of constituent organizations in the ecosystem are supportive-type organizations at 14 percent. Financial organizations representing VCs, business angels, and banks are 11 percent of the ecosystems constituents. Universities represented 4 percent of the nodes indicating a total of approximately 31 universities, colleges and technical universities noted in the ecosystem. The University of Ethiopia is one of them. 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 centrality of a node indicates its interconnectedness to the rest of the ecosystem. Centrality can occur because of much inbound connectivity – other organizations seeking information from that node. Alternatively centrality can occur from much outbound connectivity – where an organizations has many instances of seeking knowledge from others. For example, an entrepreneurial firm like NewPace is very central because they reached out for information from dozens of different organizations. Their node is rather small, however, because NewPace was not a source of information from a large number of other firms.



The size of an organization's node reflects the amount of information that was *sought of* that organization, not information that their employees might have sought from others. 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 from them. A large node like Saint Mary's University is central because it is connected to many other organizations, but also has a large node, because many organizations sought information from individuals inside that organization.

The principal constituent groups are homogeneous amongst themselves and heterogeneous between one another. Despite their heterogeneity, however, their work shares a similar mandate which is to nurture venture firms, as well as to accelerate mobility of resources (talent, people capital, and know-how), innovation, and entrepreneurship amongst the venture firms. To this end, the various types of constituents are complementary to accomplishing the mandate; the ecosystem needs them to act together. Their complementarity to ensuring the mandate's success thereby necessitates their interdependency; they must work together. In a successful ecosystem, a lack of interdependency and interaction amongst the constituents could weaken their ability to achieve hastening ecosystems' successes.

Knowledge –Seeking Requests and Weak Ties

The act of reaching out for information from persons other than close friends and family is essential to innovation and are referred to as weak ties by Granovetter (1973). In Figure 1, careful examination of the arcs (the lines connecting nodes) reveals the direction of the information-seeking activity. The small pointed end, terminating on the periphery of a node means the information was sought *from* that organization. Avive Naturals, for example, has many arcs emanating from their node; they sought information from Perennia, NSBI, Canada Business Reference Library, Halifax Port Authority, NRC-IRAP, Export Canada and the Port of Mexico to name just a few. Avive Natural's node, on the other hand, is very small because no one had requested advice from Avive.

Many of the firms on the periphery of the chart are those from which information was sought. Not having returned a survey, we have no other known knowledge-seeking associations with any other company in the AEE.

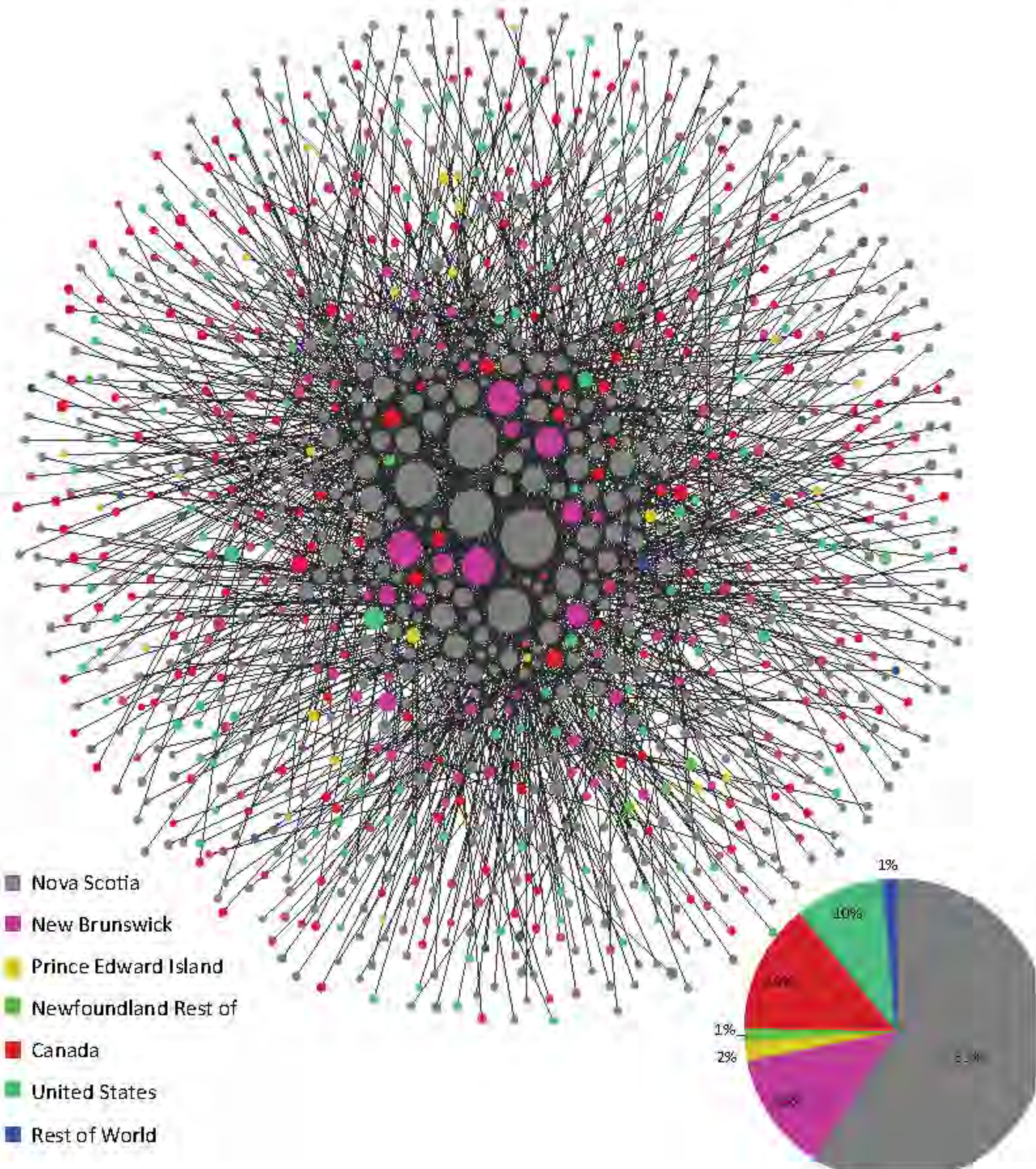
Two key types of information were suggested as the basis for respondents' information-search: 13 percent of information-requests were *Product/Service/Technical* in nature suggesting physical, product development, programming, manufacturing, service, equipment, or technical information; and 41 percent of the information-requests were for *Business/Market/ Financial* information relating to markets, business or administration, funds or finance-seeking, business operations or management information. The balance of the types of knowledge-seeking were those seeking both kinds of information (38 percent) and those looking for information other than these two key categories (eight percent).

Durable bonds were described as Figure 1 displays the importance of the information exchange by the width of the arc as well. Therefore, the importance of the product/service/technical information or the importance of the business/market/financial information is displayed by the width of the lines. Increasing the size of a .pdf version of Figure 1 highlights the different widths of the arcs. For example, GrowthWorks Atlantic places more value on the information sought from the Canadian Venture Capital Association than does NSBI because the width of the arc is wider. (This may be difficult to view on the .pdfs attached.)

Breadth and Reach of AEE

The geographic location of each individual person who was part of the weak ties request for information is charted in Figure 2. In this chart, the colours indicate the location of the person sought of for information. Most of the knowledge-seeking behaviours of the AEE are immediately proximal to the Atlantic Canadian location. Approximately 75 percent of the sources of information sought by respondents are situated in the Atlantic Region. Encouragingly, 15 percent of the nodes are from the rest of Canada, nine percent are from the U.S., leaving a remaining only one percent of ties sought from abroad. This suggests a group making good use of its reach amongst the rest of Canada and even the U.S., but little outreach to the rest of the world.

Figure 2: Geographic location of ecosystem



IMPLICATIONS & FUTURE RESEARCH

This work is novel in that it is a practical application of frameworks developed around clusters of innovation; the construct measured is more elemental and related to innovation than economic transactions alone; the entrepreneurial firms and large companies are included in the analysis compared to some studies; and the full value of network theory is deployed because of the large number of nodes represented in the research.

Firstly, this work extends the current body of knowledge by investigating the AEE as a practical application of an innovative cluster and entrepreneurial ecosystem and then applies the clusters of innovation frameworks in order to identify commonalities amongst the world's great (and not-so-great) ecosystems and clusters of innovation (Engel and del-Palacio 2009). The study quantifies the ties of the AEE's knowledge-search as a practical application of weak ties and measures entrepreneurial actions and practices that are the essence of curiosity, attempting to map the weak ties that enhance the likelihood of creating meaningful collaborations, innovation-centred relationships, or ultimate partnerships (durable bonds).

The value of the knowledge-seeking measure was further enhanced by investigating the source of the information sought. Entrepreneurs' overwhelming search for business, market and financial information rather than technical/scientific/product information is a surprising finding. A number of reasons may explain it. If entrepreneurs are competent in their design, science and production of their products, their needs may be largely related to the development of markets, delivery of product, sales techniques and methods of building a firm. That would be reassuring. In an area of challenged resources and financial capabilities, the search for business acumen and finance may be expected. However, if the entrepreneurs are spending most of their time on business-building activities with little or no product innovations or design improvements, difficulties related to immature innovations may prevail.

Second, this work represents the search for information sought by members of an ecosystem in an effort to make decisions about entrepreneurial ventures. In the Ferrary and Granovetter (2009) study, the links between organizations represented economic and financial ties whereas this study goes to a more fundamental element of knowledge-seeking or knowledge acquisition, simulating weak ties. The arcs in this work represent people-to-people requests for information thereby driving at the source of innovation, curiosity. These links may later become economic relationships, but those are outcomes that result from the cultivation of weak ties. Other research highlight the economic relationships between companies as captured in news reports (i.e. CB Insights), or whom-is-linked-to-whom in social media (such as LinkedIn) though there may never be any direct interaction amongst the two, or in observation-only searches (i.e. following Twitter accounts).

The interconnectedness of the constituents in the AEE is amply highlighted in the charts. It is recognized that governments cannot establish, or mandate, an entrepreneurial ecosystem (Soto-Rodríguez 2014); only the value creation contributions of many actors working in concert through their interconnectedness (Cohen 2006) results in a functioning

and sustainable ecosystem. However, the global imperative is clear in the cluster of innovation research. Given the AEE's proximity to Europe, Scandinavia, Africa and the Middle East the level of outreach seems North-American centric. Given that successful ecosystems have demonstrated a considerable global outreach, the AEE's efforts to bond with other global clusters needs more effort. Such engagements cannot be mandated by governments. Outward-facing nodes inoculate against dis-entrepreneurship which occurs when the community adopts an inward-facing orientation rather than an outward orientation in a globalizing world "Entrepreneurs finding themselves in communities characterized by strong client-patron relations would do well by appealing to broader regional institutions the frequently trump local oligopolies" (Honig and Black 2007, p. 286).

Third, by including entrepreneurial ventures and large companies, the breadth of the ecosystem is modelled, and the relationships between firms and universities, firms and venture capitalists, mature firms and venture firms, and governments and support groups are observed. It calls attention to the multiple parties needed to stimulate entrepreneurial ecosystems (Van de Ven 1993), and addresses a more recent call for investigations into regional and contextual influences on entrepreneurial innovation (Autio, Kenney et al. 2014). It does so by mapping the ecosystem with a revealing visual and quantitative examination of entrepreneurial ecosystems' knowledge-seeking behaviours and by highlighting the various constituent groups including entrepreneurial firms and mature corporations.

Lastly, this work extends previous network theory study of Silicon Valley venture capitalists by the sheer number of data points and breadth of constituents. It is composed of 1281 individual persons, 681 different organizations and 14** person-to-person appeals for communication. Moreover, the directional nature of the arcs in the model means that the size of an organization's node cannot be influenced by their own activities. Therefore, the analysis permits the vigour of various actors to emerge -- rather than their relative importance being prescribed -- thereby adding intensity to its conclusions.

There are many other research opportunities using network theory and entrepreneurial ecosystems. Other research may answer questions about the mix of qualities that are necessary for successful ecosystems and provides opportunities for comparison. Is there more or less focus on university, or professional support, or venture capital funding, or incubators or accelerators in the winning regions compared to those less successful ones? Are the new ventures spanning boundaries, or occupying the space of structural holes? Is it influence, contacts, and networks that drive successful ecosystems, or is it capability of a number of key players that lubricate them? Is there a critical mass of venture capital required to grease an entrepreneurial ecosystem? Is there a critical mass of people working in a similar area that drives a cluster to become an innovation network? And if so, what is that critical mass? Future research may seek to investigate these areas.

At present, a collection of scholars are preparing to conduct similar surveys of eight different cities to replicate the research, extend its breadth, and make additional data for useful comparisons.

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Dr. Ellen Farrell

THE ROLE OF MATURE FIRMS IN AN ENTREPRENEURIAL ECOSYSTEM

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This paper is an abbreviated version of a larger manuscript in progress.

The Role of Mature Firms in an Entrepreneurial Ecosystem

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Abstract

Entrepreneurial ecosystems are geographically situated collections of organisations that support the cultivation of entrepreneurial talent. Entrepreneurial ecosystems include several major homogeneous constituent groups. One of these constituent groups are mature firms (i.e. technology companies, large corporations, enterprise, big business). Little has been written about mature firms' interactions with the ecosystem, and start-ups in particular. Mature firms (non-innovating or non-growth oriented firms) benefit the entrepreneurial ecosystem in three ways. Their presence lures talent, develops deep expertise in functional and process areas, provides employees for potential spinoffs, and talent for hire for high-growth young firms. Mature companies also act as investors and acquirers for start-ups. Lastly, mature firms benefit entrepreneurial ecosystems by engaging with start-ups and growth-oriented firms in myriad other ways which is the focus of this research. The goal of the study is to investigate the amount of engagement by mature firms and start-ups as well as what they do, and how they do it. A mixed-method approach using quantitative network theory finds less-than-optimum mature firm-start-up interaction in a sample population. A qualitative investigation presents some data and highlights 18 different ways for mature firms to engage with start-ups. The author begins to develop theory about the role of mature firms in an entrepreneurial ecosystem from an inductive standpoint. This work responds to mature firm practitioners who question how they can participate in an entrepreneurial ecosystem, and to policy makers who want to learn how to improve entrepreneurial activity in a jurisdiction.

Keywords: Mature firm, Entrepreneurial ecosystem, Cluster of innovation, Entrepreneur, Start-up, Social network, Network theory, Enterprise, Corporation, Big business

1 Introduction

Social networks are important to entrepreneurial accomplishment and firm performance. Extant research indicates that firm networks are positive indicators of entrepreneurial firm performance (Lechner and Dowling, 2003). Entrepreneurs who use their network to access resources facilitate their ability to acquire finance (Fornoni, Arribas et al. 2012) and taking advantage of strong ties (where interpersonal ties are more similar in various ways and therefore more likely to be friends (Granovetter, 1973)) is linked to

sales performance (Collins and Clark, 2003). Entrepreneurs capitalize on confidence, experience, and their relation to others in social networks facilitating access to information and knowledge. Thus, entrepreneurs with greater networks and social capital influence the financial performance of their firms (Semrau and Sigmund 2012) through sales and the acquisition of finance.

Entrepreneurs compensate for their lack of resources for finance, markets and information by drawing on their social networks which provide them with access to information without having to pay for it. Indeed, start-ups often begin with little more than the social networks of their founders. In locales where many entrepreneurs are situated, the notion of entrepreneurial ecosystems (EE) describes the network of ties and support systems that connect entrepreneurs to finance, information, support and technology in the ecosystem. Born out of the concept of clusters, EE and clusters of innovation (COI) describe relations established amongst various constituents in an entrepreneurial environment where many young firms are situated, entrepreneurial processes are applied, and the specific requirements of start-ups are cultivated (Saxenian 1994, p 287). EE importance is magnified because they have become recognized as highly viable economic development opportunities and sources of regional advantage (Audretsch, Belitski et al. 2015).

An EE or COI starts as a geographic cluster of start-ups attempting to survive and succeed. A collection of other constituents with which start-ups engage include venture capital, professional support, universities and research institutions, and mature technology firms in the case of Silicon Valley (Ferrary and Granovetter, 2009), and government interactions as in Israel (2014). Recent empirical work indicates that accelerators and incubators often play a major role in EE as well (Farrell and Dennison, 2015). Ecosystems expands in the current environment of instant personal communications where an email address or a cell phone permits information and interaction acquisition from around the world. By so doing, actors from distant geographic locations are brought into the orbit of a local EE.

Much has been written about various constituents within EE or COI. The importance of universities, and venture capital dominate this literature. The objective of this paper is to assess the contribution of the mature firm constituents to the EE or COI. This work is novel in its theoretical and practical contributions. Though the roles played by mature firms within the domain of an EE or COI have been described in ethnographic and historical accounts (Saxenian, 1994), and summarized in accounts of EE (Mason and Brown, 2014), their actions have not been previously isolated for research (except Freeman and Engel, 2007). The actions of mature firms, enterprise and anchor firms are known to be important for

the development of employees who sometimes leave as spinoffs, and as acquirers of start-up firms. The roles that mature firms perform over and above these characteristics is not so well known.

The research question asks how mature firms engage with start-ups in an EE. The study therefore seeks to identify the quantity of interactions amongst start-ups and mature firms, and it also attempts to clarify what the engagements exist between the large and small players and illustrate how those engagements are executed.

2. Structure of the paper

The research objective of this study is to investigate the amount of mature firm (MF) interaction in an EE, what they do to interact with the entrepreneurial firms and start-ups (SU), and how MF engage with SU. The remaining structure of this paper begins by tracking the contributions of mature firms in an EE in Section 3. This is conducted by using the main constructs that identify a COI as outlined by Engel and del-Palacio (2009; Engel and del-Palacio, 2011). Section 4 outlines the mixed methods, sequential methodology employing network theory to assess the amount of MF-SU interaction, and a qualitative investigation to explore what MF are contributing to SU and how they are doing it. Section 5 presents the results of the quantitative network theory and qualitative investigation to scrutinize a conceptual framework for the types of specific actions mature firms may adopt in interacting within an EE or COI and the possible motivations for each. A conceptual framework and theory development for the contribution of MF to an EE are presented in Section 6. The conclusion notes both the work's limitations and future research opportunities for the Academy.

The terms of COI and EE are used interchangeably in this research to describe EE and COI. Mature firms (MF) may be small, medium or large firms, but they are corporations that are no longer growing rapidly, nor innovating. Entrepreneurial firms and start-ups (SU) are variously referred to also as young firms, founders' firms, and growth companies.

3. Extant research regarding MF role in EE

In this section, extant research is used to examine what is currently known about the role of mature firms as they interact amongst EE constituents. Knowingly, or unknowingly, do mature firms contribute to network ties and how. How they catalyse the mobility of resources and hasten testing and developing commercialising processes? Do they promote start-up know-how and business practices and what do they

offer by way of capital and finance; how do they support the innovation process and do their larger ranks promote the frequent flow of people; and lastly how collaboration is enhanced by the presence of the mature firms.

High mobility of people and talent between and among ventures

Successful COI 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 rapid failure.

Mature firms participate in seeding this cycle with an abundance of deep talent who may harbour pre-entrepreneurial intentions. Rapidly growing entrepreneurs often turn to mature firms for talent when completing the management team. As the firm grows, the likelihood of the founder being replaced is also exacerbated. And the more successful and faster the firm grows, the sooner the entrepreneurs will be called upon to look to mature firms for openings in their own management teams, and replacements for themselves (Freeman and Engel, 2007).

Age, attitude and income are influencers in entrepreneurial populations. Entrepreneurial attitude and age have an inverted U shape, albeit more pronounced in aggregate over a population, that implies an optimum entrepreneurial activity in mid-career (Lévesque and Minniti, 2011). Similarly, populations who are more advanced in age, start firms that have greater longevity. Entrepreneurs with higher previous incomes and who have greater access to resources, are motivated by income targets, and start-firms that grow faster (Cressy, 1996). Pre-entrepreneurs migrating out of MF have apparent prosperity and maturity to be more successful and resourceful during mid-life.

Employers have the ability to encourage such activity out of their firms. They might support their employees who harbour entrepreneurial intentions and who plan to leave the traditional employer workforce. This notion might even be extended to high-performing employees who are valuable to the MF, but who have a disposition to leave to pursue entrepreneurial intentions which may be competitive to their employer. Similarly, while the mature firm may not go as far as to encourage the defection of a valuable employee, they may not act to impede the intended defector either. Such was the case of Hoffman LaRoche in Switzerland when it watched four of its key cardiac researchers leave the giant pharmaceutical firm, following the disillusionment and defection of their team leader, Thomas Widdmann. Hoffman LaRoche did not impede the group either, by not enforcing the non-compete clauses for any of the individuals involved. Using licensed IP they had developed while at Hoffman

LaRoche, Widdman and his party went on to create Actilion which grew to hundreds of employees and sold in, 2017 to Johnson and Johnson for \$36 billion.

Downsizing firms also contribute to recycling of talent in an ecosystem. A mature firm down-sizing strategy may seek to support the subsequent entrepreneurial intentions of downsized employees when mature firms reduce workforce numbers. Entrepreneurs founding a firm under the circumstances of adverse events occurring to the parent firm will have previous organisational experience (Curran, O’Gorman et al., 2016). Similarly, but earlier in the downsizing process, a mature firm engaged in an adverse event may look to identify personnel willing to leave for entrepreneurial motives (Mishra, Spreitzer et al., 1998). Supporting downsized employees with entrepreneurial education, means, contacts and counselling prepares previously unsuspecting founders for potentially unforeseen opportunities.

Start-up know-how and business practices

MF develop skills in employees that enhance start-up skills and business practices for currently employed pre-founders with an innovation to launch. Likewise, MF cultivate deep knowledge in specific areas that founders acquire during their careers of which they can take advantage. However, Klepper’s (2001) summary of the literature on spinoff founders found that the nature of a spinoffs’ products and services derives primarily from their founders’ backgrounds and contributions rather than from the parent firms’ principle products or technologies.

Moreover, speculations indicate the more previous-parent-experience that founders have with their co-founders improves ventures’ performances as a result of their shared experiences, knowledge and familiarity (Cooper and Gimeno-Gascon, 1992) of each other and business practices. Dyck (1997) also used the parental dynamic to suggest that employers that were supportive of the defecting spinoffs, helped give greater lift to the start-ups’ performance than those start-up founders who leave the mature firm without “parental” backing and encouragement.

There are other skills and business practices that start-ups learn *in situ* rather than from the MF from which they departed. Founders need to be fluid and adaptive to the evolving needs of the firm (Freeman and Engel, 2007), and new founders’ abilities to validate, sell, finance, create control systems, market, design, code, hire and build are facilitated by having few organisational charts, or job roles. This may be unfamiliar territory for the talent departing from MF. Being able to respond opportunistically to customer feedback or unexpected developments, and having the personal nature and know-how to reorient their

plans in mid-start-up is a characteristic of successful entrepreneurs (Bhide, 2000) which may also be unlikely for employees from MF.

Deployment and acquisition of capital and finance

Founders whose creations have the potential to grow quickly have to secure a sufficient and ongoing source of cash flow to secure a growth trajectory where revenues lag behind spending. The search for capital is vital and the amount of time spent conducting such activities is not disproportionate to its importance. The ongoing discussions, board meetings, control systems, reporting and network development will predominantly occupy the activities of at least one of the team members. This is a perverse event since much finance is accompanied with issuing equity and is thus dilutive to the founders. The paradox of spending inordinate amounts of time for outcomes that will dilute ownership is not lost on founders who often struggle to avoid dilutive finance wherever possible. Mature firms’ roles relative to the deployment of capital in an EE or COI includes acquiring young firms outright, investing in these firms to gain an insight or an edge on a developing technology or innovation of interest to the mature firm, gain an eye to the start-ups’ intellectual property. This is discussed further in Section 6.

Rapid experimentation, testing and innovation

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 (Engel and Forster, 2014) that accelerates entrepreneurs’ understanding of success or failure and movement to commercialisation. In Saxenian’s (1994) seminal ethnographic examination of Silicon Valley, Jeffrey Kalb of MasPar mused that “... time is everything. Time-to-market is right behind cash in your priorities as a start-up” (p. x). Established firms and enterprise accelerate SU validation process by testing prototypes, providing access to resources, hiring (or firing) talent, prescribing the necessary logistics of selling into specific markets, cultivating an understanding of document control procedures in larger firms, evaluation and insights.

Validating the business case in advance prevents wasting resources on unnecessary product development (Mitra and Euchner, 2016). Mature firms contribute to creation of the business case and the value proposition without every writing a line of code particularly in B2B situations. MF facilitate the creation and testing of minimum viable products by giving rapid feedback to start-ups. Developing and testing a prototype by a willing MF accelerates rapid re-testing because customer feedback is incorporated. Concepts of iteration, stimulating the imagination, and consulting with customers is a staple of both

design thinking and lean methods of entrepreneurship. Alternatively, selling the prototype to the MF provides the SU with its first revenues.

Collaboration enhanced by mobility

The prevalence of an abundance of skills diffused throughout an ecosystem is influenced by the presence of MF and the potential spinoffs they represent. It is speculated that the greater stock of industry-informed employees in a specific locale enhances the stock of management available for start-up opportunities (Garvin, 1983). Likewise, earlier theories noted that locales or regions that housed considerable specific industrial or commercial interests (i.e. many suppliers, vendors, and employees with specific industry acumen) were inclined to have more spinoffs of employees leaving parent firms to create start-ups. The easy movement of employees from MF to SU intensifies the relationships amongst individuals and companies creating heightened affinity for alliances, cooperation and partnerships.

Rapid testing and validation

Rapid testing and validation foster the develop-pivot-redevelop learning process (Engel and Forster, 2014) that accelerates entrepreneurs' understanding of success or failure and movement to commercialisation. In Saxenian's (1994) seminal ethnographic examination of Silicon Valley, Jeffrey Kalb of MasPar mused that "... time is everything. Time-to-market is right behind cash in your priorities as a start-up" (p. x). Established firms and enterprise accelerate SU validation process by testing prototypes, providing access to resources, hiring (or firing) talent, prescribing the necessary logistics of selling into specific markets, cultivating an understanding of document control procedures in larger firms, evaluation and insights.

3. Research Methodology

A mixed-methods, sequential study using quantitative and qualitative methods was adopted for this work. In attempting to address the research question, the needs of the study to quantify the amount of MF-SU activity was best addressed by a survey-based quantitative approach. But finding out what activities MF engage in and how they were being executed required a qualitative approach. The data relative the frequency and importance of MF interactions would not prescribe specific actions taken, nor would the quantitative approach alone have been enriched by context and examples helping to inform theory development. Both research types were equivalent in importance (Molina-Azorín, López-Gamero et al., 2012).

3.1 Quantitative - network theory

Studying EEs with more quantitative approaches has been encouraged in order to contribute a different lens (Engel, 2015; Overholm, 2015) to the highly insightful and significant qualitative observations already conducted and reported earlier. A mixed methods approach was adopted to take advantage of the features of both paradigms using equal emphasis on each (Molina-Azorín, López-Gamero et al., 2012). A sequential two-phase design used quantitative network theory to identify how much mature firm activity was in the ecosystem, followed by a qualitative assessment of the different types of interactions and how mature firms were engaging with entrepreneurial types.

The construct measured in the study were knowledge seeking behaviours used by members of the ecosystem to search for information to enhance their entrepreneurial-decision making. To effectively analyse the ecosystem's knowledge-seeking behaviours quantitatively, network theory was employed which permits viewing connectivity, density and diversity of the network. Information about the knowledge-seeking activities included the importance and frequency of the ecosystem's participants' activities. For more information about the population sampling, measure, data collection and descriptives, visit (Farrell, 2017 at <http://www.smu.ca/academics/sobey/working-papers-series.html>).

3.2 Qualitative Analysis

To explore the nature and manner of entrepreneurial-mature firm interactions, case analysis was employed to learn situations and examples using: literature searches, regional media searches, and situations known to the authors. Situations where MF and SU engaged with one another were documented. General examples were sought initially, however, specific attention was devoted to finding examples of MF-SU in the Atlantic Region of Canada. The data collection methods included interviews, observations, and reviewing literature and news stories

Table 1 - Mature Firms' Interactions with Entrepreneurs

Mature Firm	Location	Description of Action	Entrepreneurs Engaged	Details	Source
Beckman Instruments	Silicon Valley	Provided finance to establish new firm	New firm Shockley Semiconductor spawned with finance	Deep resources of mature firms are insignificant to large firms, but are vital and instrumental to entrepreneurial firms	(Engel and Forster 2014)
Fairchild Camera and Instruments	Silicon Valley	Mature firm in non-financial industry provided finance for establishment of new firm	Ent – Fairchild Semiconductor created and later Intel and Kleiner Perkins Caufield & Byers created, Philips, AMD	Many other companies were spawned from the original eight who left the firm Typifies rapid reemployment and movement between firms	(Engel and Forster 2014)
F. Hoffmann - La Roche Ltd	Switzerland	Waived non-competition clauses Later closed cardiovascular research division and put IP up for licensing.	Former employees, now entrepreneurs – Co-founders Jean_Paul Clozel, Martine Clozel, Walter Fischli, led by Thomas Widmann	1997, Large pharmaceutical firm chose not to support further testing for a new hear drug innovation; Former employees raised \$US\$46 million in two rounds of VC; Spawned Actilion; Then to highly successful IPO \$146 million US.; Billion dollar market valuation now; sold to Johnson & Johnson \$36 billion; One founder went on to lead Vinci Fund & Herperion	(Jones 2015) https://medium.com/lsmagazine/team-actilion-5716eb965a28#.b311y0jco
McCain Foods	Atlantic Canada	Mature firm collaborated with ent'l firm when requested; Provided data to ent'l firm in order to identify an important problem to solve for the mature firm	"The only thing Baxter and Shawn Carver knew was that they wanted to work with McCain on a project involving advanced analytics. The exact nature of the project would be determined by interviewing McCain employees and discovering what component of the international food business would benefit from advanced analytics."	FiddleHead went on to achieve seed round of \$1.8 million from Build Ventures and NBIF "co-creation — the partnering of a start-up and a large company to attack a corporate problem. "	(Build Ventures 2016) http://business.financialpost.com/entrepreneur/fp-startups/how-to-reverse-engineer-a-startup?_lsa=3899-4e34 (Casey 2016) Financial Post
Verifin robotics and financial security firm	Atlantic Canada	Created a work space	Incubator and Entrepreneurs benefitted Startups associated with an accelerator, Genesis, received all the old furniture from Verafin;s new 200-person office move; Metrics Flow , Mysa Smart Home Thermostats , and Vish Salon Tech , along with exciting graduates Agile Sensors , HeyOrca , Solace Power , and Whitecap Scientific all accepted some furniture	Recycling furniture and equipment to growth start-ups in the locale	https://medium.com/genesiscentre/giving-back-genesis-grad-verafin-supports-local-start-up-community-b516a763774d#.7009xkgc7
SAP	MNC	Created HANA, a platform	Entrepreneurs to build their businesses & products, a bit of a recruiting tool for SAP	Cultivate relationships by holding contests and offering scholarships to entrepreneurs	(Mitra and Euchner 2016)

DMGT Group	UK	Worked with One Million by One Million	Britain's largest media group wanted entrepreneurs to participate in developing their innovation agenda	Used commercial acceleration and incubation group One Million by One Million to get entrepreneurs to help with their businesses	(Mitra and Euchner 2016)
NSPower	Atlantic Canada	Wanted to identify ways to contribute to economic prosperity via interactions with entrepreneurs	Ultimately entrepreneurs via University	Could be used to sponsor prizes and funding for emerging start-ups, but may likely go into the construction of a building on campus and the entrepreneurs may see little obvious comingling with the MF	Personal knowledge of author
Elmsdale Lumber & Ecan Lumber	Atlantic Canada	Entrepreneurs needed help in understand dynamics of timber industry in Canada & US	Entrepreneurs used the contacts of a University professor to gain access to long-term significant players in the Canada/US cross border lumber industry. Four hours with two different participants in the industry benefitted entrepreneurs	Traditional Timber was launched with early success.	Traditional Timber Personal knowledge of author
Louisbourg Seafoods	Atlantic Canada	Created an open innovation competition Sea++; Rapid Business Competition with Dragon Den style Sunday night session	Innovators, entrepreneurs, existing small businesses were asked to solve seafood and fishing business problems; \$5k and \$1k prizes; designed to tap into local tech community to solve local fishery problems	Competition open to anyone to help solve one of five problems: contest entrants were asked to look at improving ore or more problems -- mobile and fixed fishing gear, to solve an issue in aquaculture, to improve sales and marketing, or to solve an issue in the management of a fishing enterprise; Adam Mudgridge	(Moreira 2016) http://entrevestor.com/ac/blog/louisbourg-seafoods-launches-sea http://www.cbc.ca/news/canada/nova-scotia/cape-breton-louisbourg-seasfood-tech-sector-sea-plus-plus-1.3530797
Cisco	Atlantic Canada	Cisco Innovation Grand Challenge, a global competition that helps Cisco	Fredericton entrepreneurial firm, Eigen Innovations, won third place spot with Cisco	Eigen Innovations of Fredericton placed third; build relationships with innovators; "Many are "too young to have real-world experience to completely understand problems that businesses encounter, so they never get the ideas that lead to killer applications. For that reason, some early-stage companies are based on weak ideas."	(Moreira 2015) http://entrevestor.com/ac/blog/closing-the-startup-corporate-gap
Mariner Partners	Atlantic Canada	Established a division, East Valley Ventures, to invest in specialized IT applications	Created a division for making investments into innovating entrepreneurs with synergistic properties for Mariner and the Region	Providing mentorship, advice, entrepreneurial financing, and vision to mover young firms further along their growth trajectory	http://marinerpartners.com/

4. Results

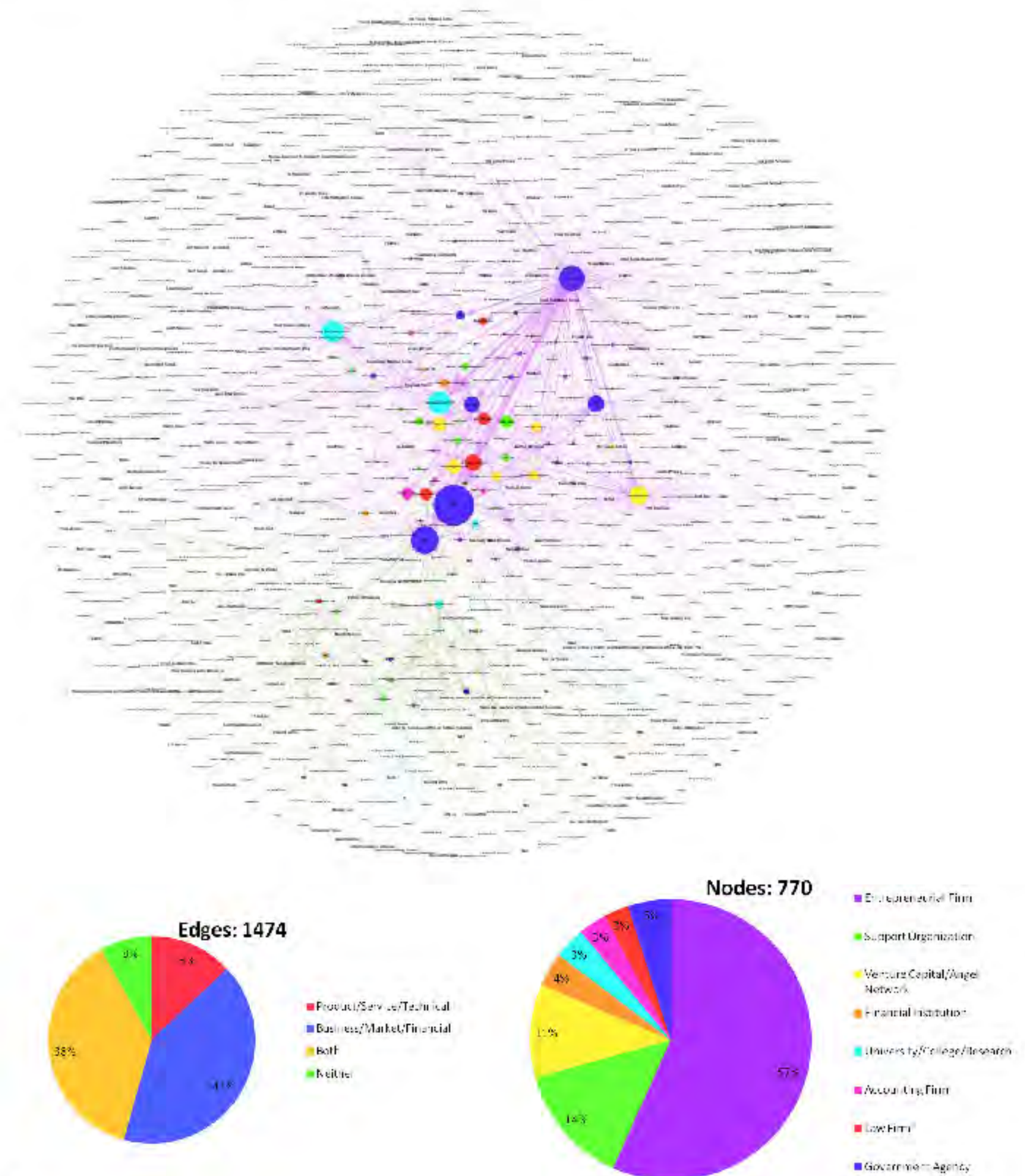
The results of the quantitative and qualitative approaches are discussed below. The quantitative analysis of egos in the entire ecosystem measures inbound and outbound requests of knowledge are presented first. The findings of the qualitative exploration of how MF engage with the entrepreneurial ecosystem and what they do follows.

Quantitative analysis

The targeted sample for the AEE began with a base list of 148 qualified potential respondents and grew as other entrepreneurial locales were noted by respondents. This quantitative analysis employed the egocentric method of network theory (as opposed to whole network method) because the total population of entrepreneurial firms is unknown. Rather than trying to capture the whole network, we seek detail information about the personal networks of each of a sample of individuals (nodes or egos) relieving the requirement for strict onerous response rates onerous (Grosser and Borgatti, 2013) which are impossible to accurately achieve know when populations are not known.

The composition and nature of the related nodes and the type of information sought and indicates the respondents' networks when actively searching for information about their entrepreneurial endeavours are shown in Figure 1. The knowledge-seeking activities of the entire AEE are very complex. There are 781 different organisations represented in the reported Atlantic EE and 1474 separate knowledge-seeking relationships defined. For information about how to read interpret these network graphs, please visit (Farrell, 2016 <http://www.smu.ca/academics/sobey/working-papers-series.html>)

Figure 1 - Atlantic Entrepreneurial Ecosystem



Using the same data but stripping out all knowledge-search behaviours that are not related to MF produces the chart shown in Figure 2. This chart has the same properties as that of Figure 1, but shows the inbound and outbound requests only as they related to MF.

Figure 2 - Ecosystem Interactions Involving Mature Firms

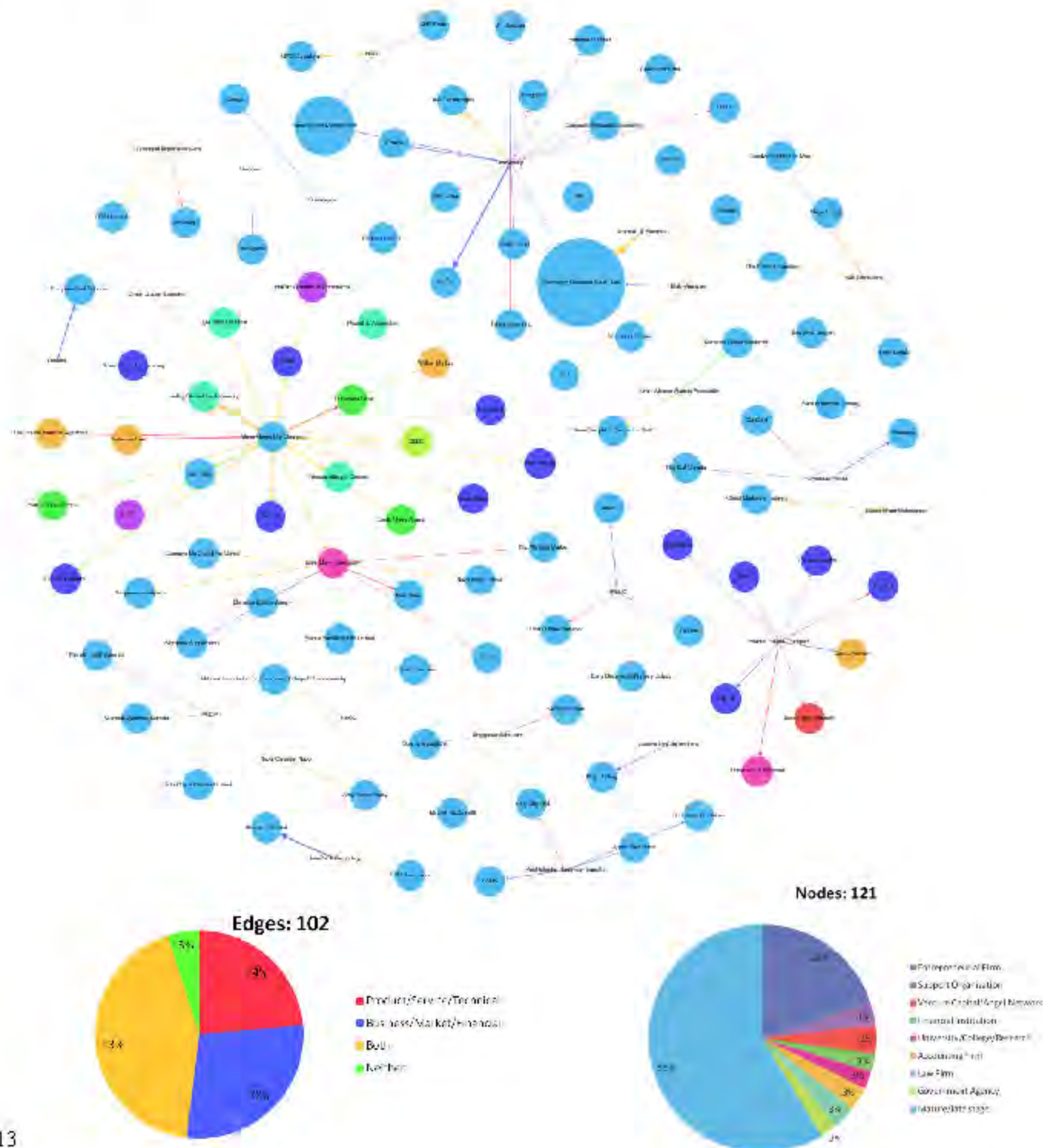


Table 2 simplifies the constituent and direction of the requests in a table format. When MF are the target of ecosystem participants, entrepreneurial firms and venture capitalists equally dominate the requests for information. When the MF are instigating the information-search behaviours, they are principally searching for information from entrepreneurial firms. The EE respondents have a total of 1474 interactions amongst all the participants (Figure 1), but includes only 39 communications amongst entrepreneurial firms and MF (27+12). There is no extant research to compare this to, however, it appears that the proportion of MF-SU firm interaction is very light as a proportion of all interactions in the ecosystem (2.6% = 39/1474).

Table 2 - Mature Firms as Target and Instigator of Ecosystem Information

Type	Mature Firm as a Target: search for information from a Mature firm by:		Mature Firm as Instigator: search for information by a Mature Firm from:	
	#	%	#	%
Venture Capital/Angel Network	27	37%	1	3%
Entrepreneurial Firm	27	37%	12	40%
Government Agency	4	5%	1	3%
Support Organisation	3	4%	2	7%
University/College/Research	11	15%	2	7%
Law Firm	0	0%	4	13%
Financial Institution	0	0%	3	10%
Accounting Firm	0	0%	4	13%
Mature Firm/Late stage	1	1%	1	3%
Total	73	100%	30	100%

Qualitative Analysis

The qualitative approach to investigating mature firms manners of supporting entrepreneurial endeavours uses a more inductive approach -- investigating actions actually executed and developing a framework to classify them (McEnany and Strutton, 2015). In some cases it was difficult to identify whether the founder or the MF initiated the engagement. A short table of those interactions appeared in the

Qualitative Analysis sub-section of the Methodology, Section 3. Collecting all the various different situations produced the following table, Table 3, which enumerates various combinations of connections. For the sake of shining a spotlight on the collaborations, efforts were to elaborate as many different items rather than trying to consolidate them. Hopefully, this list will be useful to entrepreneurs, as well as executives and managers in MF.

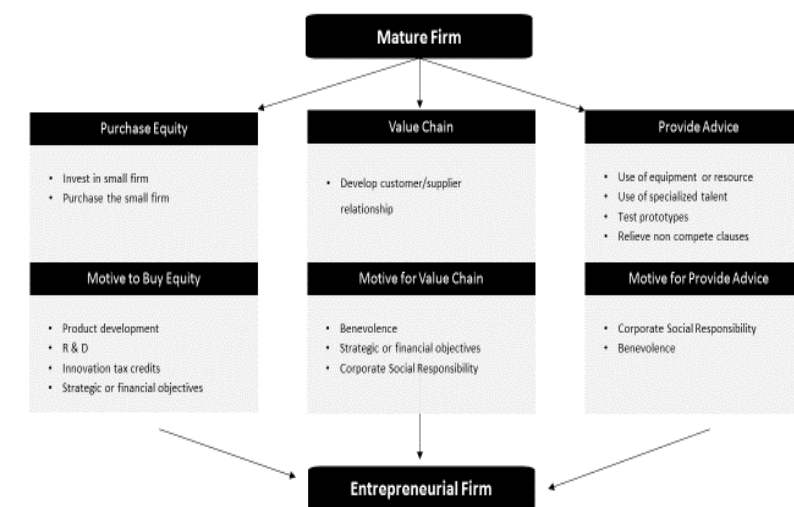
Table 3 - Nature and Types of Interactions Between Mature Firms and Entrepreneurial Firms

1.	Conduct R&D by posing problems for solution by entrepreneurial firms such as open innovation invitations, competitions, or hackathons
2.	Test prototypes developed by entrepreneurial firms
3.	Lend engineering talent and other operational and process capabilities
4.	Lend administrative or logistic support such as boardrooms, offices, equipment, photocopiers
5.	Government policy to provide in-kind support of contributions by mature firms
6..	Lend equipment and resources that are difficult or expensive to acquire or purchase
7.	Donate materials, furniture old equipment to accelerators or start-ups
8	MNC provide high paying jobs and stability and potential new entrepreneurs (Samsung, McCains, Emera, Louisburg Seafood)
9.	Accelerate commercialisation
10.	Introduce entrepreneurs to network of suppliers and 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 leading to product market fit
14.	Customer trials
15.	Assist with field trials
16.	Help in the identification and development of key qualities start-ups need for mission critical situations (i.e, document control procedures, pretests, site visits)
17.	Investing alongside start-ups
18.	Outright purchases of start-up firms (for products, services, knowledge, or acqui-hires)

5 MF interactions with SU: Discussion and theory development

Both the first and second approaches of MF contributions to SU in entrepreneurial ecosystems further MF strategic or financial objectives – first by incorporating entrepreneurial firms into MF value chain by selling to, or buying from them, or second by investing in, or acquiring, entrepreneurial firms. The third alternative manner of supporting EE or COI start-ups are not necessarily centred on the needs of the MF, but rather with the needs of the EE. The third major category are those tactics adopted by MF that are neither investment-, nor acquisition-, nor value chain- or channel of distribution-based. These MF contributions are expressed as contributions of advice, services, equipment, logistics, contacts, intellectual property, open innovation opportunities, or talent for the founders. The remaining discussion relates to the latter option, alternative engagements.

Figure 3 - Types of Support and Related Motivations by Mature Firms for Entrepreneurs



Alternative contributions by mature firms

These alternative involvements make use of capabilities and resources that are resident in MF, yet needed by small firms and very expensive them to acquire. MF efforts to reach out to growing entrepreneurs are virtually costless to a large firm, but priceless to a start-up. By representing small costs to MF, with little

ostensible benefit, they could be said to be responding to social responsibility norms or objectives, or altruism. Altruism is recognized as a promising approach for entrepreneurial environments as outward-looking mature firms attempt to develop ties with non-competing (and sometimes even competing firms) to cooperate and collaborate in open innovation contexts (Formica, 2017).

The third manner of supporting EE or COI start-ups have a more altruistic nature. The third major category are those strategies adopted by mature firms that are neither investment-, nor acquisition-, nor value chain- or channel of distribution-based. These MF contributions are expressed as contributions of advice, services, equipment, logistics, contacts, intellectual property, and talent for the founders. These involvements are capabilities and resources that are resident in MF, yet needed by the small firm. MF efforts to reach out to growing entrepreneurs are virtually costless to the large firm, but priceless to the start-up. By representing small costs to MF, with little ostensible benefit, they could be said to be responding to social responsibility norms or objectives.

MF may experience difficulties in implementing actions to integrate themselves into the start-up EE because long hierarchical organisational relationships do not lend themselves to engaging a MF embedded employee with a SU. An engineer in a mission critical area of a large organisations may a) not have the authorisation to act outside of her role, or b) does not see participation in the EE as part of her job description, or c) perceives that this is not an action that will result in an improved performance evaluation.

Mature firm social networks are created over long periods of time with internal nodes (employees interacting amongst one another) and external nodes (suppliers, customers, stakeholders, other members of the value chain) participating with one another through various levels of the organisation (Mizruchi and Stearns, 2001). Mature firm networks are composed of strong and weak ties which individuals search for advice and knowledge from peers and colleagues about transactions and deals. They deploy their networks to acquire approvals (a natural part of the hierarchy of large firms) uses resources to enhance “personal expected returns” (Lin, 2000). However, in some very hierarchical, very well-established firms, conditions of uncertainty incline employees to cling to networks that are built of strong (close and familiar) ties, rather than weak (broader less friendly, but more informative) ties. This situation creates a paradox because weak ties are more closely linked with success (than strong ties) by gathering diverse and wider range of information (Granovetter, 1973). “Not only does this illustrate the simultaneous weakness of strong ties and strength of weak ties, but it also shows how our social instincts can run counter to our best interests” (Mizruchi and Stearns, 2001, p. 667). From the mature firm perspective,

building networks that develop relationships with entrepreneurs, start-ups, co-founders, or new venture teams may not seem like the most successful strategy for enhancing one’s own career.

Entrepreneurial firms, on the other hand, may be busy building networks that do not complement the types of relationships required for successful early stage venture development. Entrepreneurs build their networks starting with principally the original co-founders’ networks and build them out over time and with ensuing addition of colleagues and their networks. When start-ups’ many interconnections include linkages with MF (‘leaders’), the benefits reinforce one another. Founders and start-ups gain the experience and support of MF, while at the same time, the combination can urge entrepreneurs to situate in these locales providing the essential elements for the genesis of innovation ecosystems (Dedehayir, Mäkinen et al., 2016).

The types of ecosystem development activities that MF are engaging with SU are rich, and resourceful. The engagements occur in both directions though there does not appear to be enough of them. Also, it is yet unknown, for example, whether the relative paucity of MF-SU activity outlined in the quantitative results is a result of SU failing to reach out to MF, or whether MF are unresponsive when approached. There are clearly very divergent power and resources at play in such requests which can hamper future relations (Mayoux, 2001; Woolcock, 2001). In one instance, an offer of an open innovation collaboration made at a community meeting seemed to fall on deaf ears, thought the MF executive who made the offer. Others perceived the audience’s silence to be deference, awaiting more information and instruction.

6. Conclusion

This study investigated the interactions between entrepreneurial start-ups and mature firms in an EE. Specifically, it explored what MF do to support SU, how they do it, and how much activity exists between the two. The results from the quantitative analysis indicate that the network connections between MF and SU need development. The linkages within the study population showed fewer interactions than would be expected given the importance of MF in the extant literature. The qualitative analysis produced a rich tapestry of alternative mechanisms for MF to collaborate with SU (Section 4). In addition to the more well-known MF contributions of investing, acquiring or incorporating SU into their value chain, the results inventory surprising opportunities for SU and MF.

This work has important theoretical and practical implications. The roles played by MF within the domain of an EE or COI have been rarely isolated for research and contributions to theory. Extant

research shows the potential importance of roles played by MF (or enterprise, or anchor firms) as they consider community and social responsibility objectives and commitments to the locales in which they work. Practically, regions implementing growth strategies for economic development purposes (Ivany, d'Entremont et al., 2014; Saillant, 2014) look to entrepreneurship and the creation of EE to influence regional prosperity (Audretsch, 2015). This work outlines features that policy makers may consider to enhance regional prosperity. Lastly, there are specific practical actions that MF can contribute to a COI are listed and discussed for the executive, or senior management group, of large or mature companies. SU are advised to develop their networks and to extend that reach to (weak tie) associations with MF.

The qualitative study identified dozens of cases of successful MF-SU interactions; a crude typology of possible interactions was created. The direction of the initiative is central. On the one hand, SU cannot wait to be invited to collaborate or supported; MF need to be approached (appropriately) for most SU to have even a remote probability of successful interaction. Yet, on the other hand, the incidents noted here span a variety of different ecosystems and countries including US, UK, Switzerland, and our specific area of interest, Atlantic Canada. In Atlantic Canada two MF were recorded as having made overtures to open innovation collaborations at a community level. Future work could usefully identify the genesis of the open innovation invitation initiative within the MF, as well as the manner of its disseminations and reception by the local EE. These are practical issues about which more should be known.

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Mapping Knowledge Seeking in the St. John's and Corner Brook Entrepreneurial Ecosystems

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Contents

Acknowledgements	3
Executive Summary	4
Glossary and Acronyms	6
Introduction	7
Project Background	8
Project Rationale	10
Project Objectives	11
Research Methodology	11
Clearances	14
Project Findings	14
Discussion	18
Knowledge Mobilization	20
Recommendations	20
Conclusions	21
References	23
Appendix 1: Survey Instruments	28
Appendix 2: Ecosystem Maps	29

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Executive Summary

This is the final report for the Harris Centre Applied Research Fund project: Entrepreneurial Ecosystems: Mapping the Extent, Roles, and Effects in St. John's and Corner Brook. The research mapped the knowledge-seeking activity of actors at the micro-level in both regions using proven network theory and analysis methodology. The entrepreneurial journey can, in part, be summarized as a process of discovering and exploiting opportunities with knowledge seeking critical to this process. While work has examined firm-level knowledge seeking, little has been done to map ecosystems based on entrepreneurial knowledge seeking. Moreover, an examination of this kind had not been conducted in either region and was particularly important in light of recent ecosystems enhancement efforts. This study was, then, the first attempt to address this gap in our understanding of these ecosystems.

The research methodology and approach used can be divided into two main phases, data collection and data analysis. A survey was used to collect data, between October 2016 and June 2017, from 156 respondents (51 in Corner Brook and 105 in St. John's). Data from these enable us to quantitatively map the knowledge-seeking behaviours of participants in the two ecosystems. In particular, data was gathered on four elements of the respondent's knowledge-seeking: who they contacted; the importance of the interaction to the survey participant; how often interactions occurred (frequency); and the type of information being sought (business/ market/ financial information or product/ scientific/ technical information). The frequency of communication (i.e. phone, face-to-face, and electronic) was based on the previous 12 months activities, while importance was ranked using a seven-point Likert scale. Respondents described who they were seeking knowledge from based on given categories of ecosystem actors (i.e. entrepreneurial firm, support organization, venture capital/angel network, financial institution, university/college/research, accounting firm, law firm, government agency).

The data revealed six main points. Firstly, encouragingly, overall both regions have, arguably, many of the organizations and people needed for a thriving entrepreneurial ecosystem. Each region has entrepreneurial firms, support organizations, venture capital/angel network presence, financial institutions, higher education facilities, accounting and law firms, and government agencies, all of which appear to be playing, generally, a positive role. Secondly, most troubling is what appeared to be a lack of interaction among entrepreneurial firms in both regions. The data showed roughly four times more knowledge seeking from government and support organizations than peer to peer knowledge seeking. Thirdly, overall the responses showed significantly higher knowledge seeking behavior related to business/market/financial rather than product/service/ technical knowledge. The lack of product/service/technical knowledge seeking might reduce innovation in entrepreneurial firms. Fourthly, the amount of entrepreneurial firm-to-mature firm knowledge seeking was limited. Arguably, entrepreneurial firms should be leveraging mature firm knowledge. Fifthly, in addition to government, the maps show that entrepreneurial firms were also seeking knowledge from university/colleges and support organizations. This is a positive role in the ecosystems, though the issue of these relationships crowding out entrepreneurial firm peer

relationships should be further examined. Finally, and also somewhat troubling, is that both ecosystems lack external connections beyond their regions. Survey respondents seldom referenced connections in Atlantic Canada and even fewer referenced any beyond Atlantic Canada to the rest of the world.

Reflecting on our findings we would make the following recommendations to actors in both ecosystems.

- 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 and their local entrepreneurial organizations. At the same time, they should maintain their knowledge seeking relationship with support organizations and others in the ecosystem.
- Support organizations and government agencies should consider funding and/or strengthening entrepreneurial networking (e.g. in addition to providing information themselves they should direct knowledge-seeking entrepreneurial firms to other entrepreneurial firms).
- Support organizations might also try to react to entrepreneurial firms rather than be as proactive as they have been (e.g. waiting for them to request knowledge rather than trying to anticipate their needs and, in effect, running the risk of shaping, inadvertently, knowledge seeking activities by their actions).
- Support organizations and universities/colleges could organize events that bring mature firms and venture capital firms in regular contact with entrepreneurial firms and their ecosystem. These could include hosting hackathons and inviting the firms, hosting networking events for entrepreneurial, venture capital and mature firms.
- Mature firms could make more effort to interact/mentor entrepreneurial firms in their regions. Examples of how they could help include: supporting startups through including them in their R&D efforts, hosting hackathons; providing office hours whereby entrepreneurial firms could speak to mature firms, lending resources and/or expertise to entrepreneurial firms, buying products from them, introducing entrepreneurial firms to suppliers, customers, and industry partners, and assisting with the testing of prototypes.
- All ecosystem actors should look to expand extra-local knowledge seeking, e.g. new international linkages could be shared with other ecosystem participants to forge new regional links to extra-local places, combining resources to attend trade missions and trade shows.

Glossary and Acronyms

ACOA - Atlantic Canada Opportunities Agency

NL - Newfoundland and Labrador

Introduction

This is the final report for the Harris Centre Applied Research Fund project: Entrepreneurial Ecosystems: Mapping the Extent, Roles, and Effects in St. John's and Corner Brook. The result of this project was to map both ecosystems based on the knowledge-seeking behavior of regional actors using proven network theory and analysis methodology (Borgatti, Everett, & Johnson, 2018). The project's data provided details of the knowledge seeking by ecosystem members leading to a deeper understanding of the nature and extent of this activity in St. John's and Corner Brook. This kind of examination had not been done in either place and was particularly important in light of recent efforts at ecosystem enhancement (e.g. the establishment of Common Ground Coworking, government funding for various industry groups, the creation of Memorial's Centre for Entrepreneurship, and the ongoing work of Navigate on Memorial's Grenfell campus). The fundamental reason for examining entrepreneurial firms, and here they are defined broadly and inclusively as any firm which had started within the previous five years, in Newfoundland and Labrador (NL) is that it is a crucial aspect of economic development. Entrepreneurs have created the small and medium sized firms which provide approximately 92% of non-government employment and, depending on how it is measured 20-40% of provincial GDP (Government of Canada Small Business Statistics, 2016). From this perspective, entrepreneurship development should be, and is, an important element in NL's economic development efforts. In examining knowledge seeking in these two ecosystems this project contributes by offering insights into an important never examined aspect of their operation.

Generally, many argue that facilitating entrepreneurship is a key to generating strong economic performance (Audretsch, 2015; Ribeiro-Soriano, 2017). There has been a heightened interest in studying entrepreneurial ecosystems over the past number of years in an attempt to understand and even emulate the entrepreneurial successes of the better known ecosystems (see for example: Acs, Stam, Audretsch, & O'Connor, 2017; Malecki, 2018). An entrepreneurial ecosystem is a unique, complex, self-sustaining environment that supports entrepreneurial activity (Feld, 2012; Malecki, 2018; Spigel, 2017). Ahmad & Hoffman (2008) suggest that it is a combination of three factors: opportunities, skilled people, and resources, while Isenberg (2010) proposes that ecosystems encompass six domains: policy, finance, culture, supports, human capital, and markets. Generally, the study of ecosystems has focused on more qualitative approaches using cases, ethnographic, and historical methods (see for example, Korsgaard, Ferguson, Gaddefors, 2015). Some of the more popular or grey literature asserts that entrepreneurial firms must play a key role in organizing and defining their ecosystem (Feld, 2012; Isenberg, 2010; Napier & Hansen, 2011). This includes frequent local activities (e.g., mentoring sessions, startup activities, coffee clubs, etc.) and communication among entrepreneurial firms and other ecosystem participants. According to this view, governments, universities and other organizations play important supporting, funding and/or 'feeder' roles. While building and maintaining the ecosystem must be led by entrepreneurs (Feld, 2012; Isenberg, 2010). While this body of ecosystem research has been growing over the past decade, the quantitative mapping of ecosystems, as done here, is in its infancy.

This project was organized, using the same approach, in collaboration with St. Mary's University (overall project lead), Memorial University of Newfoundland, Cape Breton University, the University of Prince Edward Island, and Université de Moncton. Our method was to undertake a quantitative approach using network theory (Farrell & Dennison, 2015; Motoyama & Knowlton, 2014). Combining entrepreneurial ecosystems research with network analysis, as demonstrated by Dr. Farrell's work in Nova Scotia, offers a new and important perspective and has shown promise as a means to enhance our knowledge of ecosystems. Previous work by Lam et al. (2013) and Vodden, Tucker, Gibson, & Holley (2011) on this province's West Coast and Northern Peninsula have shown the contribution network analysis can make to better understanding Newfoundland and Labrador's (NL) regional development dynamics. This study will build on the previous use of network analysis in regional development studies and broaden its use to mapping entrepreneurial firm knowledge seeking activity in the two regions.

The report is divided into three main sections, the first provides the project's background, rationale, objectives, and research methodology. The second discusses the data and presents findings, while recommendations are outlined in the final main section.

Project Background

The entrepreneurial ecosystems literature provides a useful background for our work. Ecosystems study is a developing area of scholarship and there are still limitations with the approach. Generally, Spigel (2017) has argued that the emerging focus on entrepreneurial ecosystems has been undertheorized and lacks evidenced-based research. More particularly, much of the ecosystems work, while very good at mapping ecosystem participants, has failed to examine the relationships between participants at the micro or granular level (Motoyama & Knowlton, 2016). Knowledge seeking between ecosystem participants and outside ecosystem boundaries is, arguably, a key activity especially for knowledge-based innovation driven startups. Research in a variety of areas clearly shows that knowledge, networks, and social capital are important in the startup process (see for example: Aldrich & Zimmer, 1986; Stuart & Sorenson 2005).

The use of the ecosystem metaphor is meant to invoke the idea that "entrepreneurship takes place in an interdependent community of actors" (Stam, 2015: p. 2). This represents a shift from typical research on entrepreneurship, distinguishing between on the one hand; research on entrepreneurs themselves and, on the other, studies of the broader contexts in which entrepreneurs operate (e.g. Autio et al, 2014). It is increasingly recognized that there is a need to think of entrepreneurship and economic development at the system level (Acs, Autio, & Szerb, 2012). The ecosystems approach is similar to cluster and learning regions, innovation systems, triple/quadruple helix, and creative class theories in that it focuses on the spatial environment and the interaction of key actors in the region (Stam 2017; Spigel 2017). According to the ecosystems view, many of the resources needed for entrepreneurial success exist at the regional level versus within the firm itself (Spigel, 2017). However, ecosystem models differ from these models in their

clear focus on the entrepreneurial firm/entrepreneur instead of on the relationships or interactions among the constituent actors (e.g., firms, governments and universities) (Stam, 2015). These resources include knowledge held by local and non-local supports including suppliers, universities, lawyers and accountants, government officials, and other entrepreneurs. Consequently, the ecosystem model offers a fuller analysis of entrepreneurship and its impact (Audretsch, 2015; Motoyama & Knowlton, 2014). Examining entrepreneurial firms using an ecosystems lens, therefore, offers a multifaceted and important developing perspective.

Aspects of the ecosystems literature relevant to this project relate to policy, stage of development, and university involvement. The focus of ecosystem policy is the subject of some debate. For example, Isenberg (2011), and Mason and Brown (2013a & b) suggest the entrepreneurial ecosystem policy should be focused on high-growth entrepreneurs since their impacts on innovation, employment and economic growth are dramatic. Stam (2015, see also Stam et al, 2012) argues that entrepreneurial employees and innovative startups can also have economic benefit and should be included in the ecosystem approach. Researchers have recognized that ecosystems can move through a life cycle. Brown and Mason (2017) distinguish between embryonic and scale-up ecosystems, while Cukier, Kon and Krueger (2015) have developed a four stage model of startup ecosystems including; nascent, evolving, mature, and self-sustainable. The point here is that not all ecosystems are alike, that sustainability is based on constant renewal via new startups (Malecki, 2018), and that development depends on the actions of a range of actors, with entrepreneurs and their firms in the lead (Autio et al., 2014; Feld 2012). Interestingly, universities are often invoked as hubs and central actors of successful entrepreneurial ecosystems, with only entrepreneurs considered more critical to ecosystem success (Bramwell & Wolfe, 2008; Malecki, 2018; Motoyama & Knowlton, 2017). The success of university involvement is usually based on intermediaries including technology transfer offices, incubators, research centres, and makerspaces that support the local ecosystem(s). Of course, universities and colleges also provide highly qualified personnel who play important roles in entrepreneurial ecosystems (Bramwell & Wolfe, 2008).

The key focus of this study is the knowledge seeking behaviour of ecosystem participants. Knowledge seeking activities has attracted considerable research interest over the past few decades, and the capacity to search, find, and exploit opportunities is seen as critical to innovation in a knowledge-based economy (Wu & Wang, 2017). The entrepreneurial journey has been summarized as a process of discovering and exploiting opportunities, and in this way, using firm knowledge seeking capacity to rapidly find and exploit economic opportunities is critical to gaining economic benefit (Alvarez & Barney, 2007).

The Schumpeterian view of entrepreneurship places significant emphasis on the individual entrepreneur and internal knowledge capacity of the entrepreneurial firm, including research and development through the firm's own resources (Schumpeter, 1934). Though more recent research suggests that firms interacting with universities, research and governments agencies, suppliers, and customers produces more valuable

innovation outcomes than insular intra-firm R&D efforts alone (Hall, Walsh, Vodden, & Greenwood, 2014; Tappeiner, Hauser, & Walde, 2008). The growth of complexity in innovation also reduces the adequacy of internal firm knowledge, causing firms to involve more partners and sources of knowledge in their innovation processes (Wu & Wang, 2017). Generally, research on firm knowledge seeking has highlighted the importance of external knowledge to firms (Chiang & Hung 2010). The literature also posits that a firm's ability to seek and recognize value in external knowledge is based on the firms' internal knowledge. In order to use it, the new knowledge needs to be assimilated with what the firm already knows (Cohen & Levinthal, 1990). This view raises the critical importance of a firm's capacity to understand and guide their knowledge seeking (Cohen, & Levinthal, 1990; Grimpe & Sofka, 2009).

Other work suggests the need within the entrepreneurial firm for broadly based wide ranging knowledge seeking strategies. These strategies include, 'how to search' or breadth and depth of searches (Laursen and Salter 2006). Wider breadth searches implies multiple sources, while depth alludes to fewer sources and a more intensive search. Research has noted that firms with wider breadth search strategies tend to be more innovative, but that there are decreasing returns (Ferrerias-méndez, Newell, Fernández-mesa, & Alegre, 2015; Laursen & Salter, 2006;). Search strategies also comprise 'where to search' or the importance of local versus non-local knowledge search (Bathelt, Malmberg & Maskell, 2004). Knowledge spillovers in clusters reveals the importance of local buzz and local knowledge is important, while the concept of global pipelines stresses exchanges with external actors (Rodriguez-Pose, 2010). Other research shows that regionally located technological laggards spend more effort learning from local sources of information than non-local sources (Giuliani & Bell, 2005; Wang, 2015). Accessing non-local knowledge, then, seems to indicate greater firm innovation. A third difference in search strategies distinguishes between relatedness/unrelatedness in innovation, or the overlap between external knowledge searches and the firm's existing knowledge. Wu and Wang (2017) found that related knowledge search helps low-tech firms while unrelated knowledge search supports product innovation in high-tech firms.

While the literature on ecosystems and firm-level knowledge search in informative and the literature strongly suggests the importance of knowledge for entrepreneurial firm creation and development, little research has been done specifically on the knowledge seeking activities of entrepreneurial firms. This work addresses this gap in our understanding.

Project Rationale

The evolving St. John's and Corner Brook ecosystems had not been mapped so this project promised useful insights into their functioning. Further, as this work will, in the future, be compared with other studies being conducted by our project partners across the Atlantic region, there was the distinct possibility of learning from other similar regions. As such, this project will be valuable to ecosystem members and supporters, policy

makers, academics, and other stakeholders. Moreover, the work will have practical implications for how these ecosystems can be understood, their strengths and weaknesses, and what can be done to improve them, especially as it relates to their knowledge seeking activities.

Project Objectives

This work's objective was to map the knowledge seeking activity in the St. John's and Corner Brook entrepreneurial ecosystems, using social network methodology. In particular, we identified a number of the participants in each ecosystem, mapped their knowledge seeking activity and analyzed these to better understand their dynamics with a view to recommending improvements to ecosystem participants and other stakeholders. Before discussing the details of our methodology it is important to note that we were not attempting to map the entire ecosystem, but rather we gathered a representative sample of the entrepreneurial firms in each ecosystem and mapped their relationships (for more details on this sampling method and its rigour, see: Grosser & Borgatti, 2013).

Research Methodology

The research methodology used in this work can be divided into two main phases, data collection and data analysis. Data collection was based on a quantitative survey instrument developed by Dr. Farrell at St. Mary's University and adapted for the St. John's and Corner Brook regions (see Appendix 1 for copies of each instrument). The surveys were designed to provide data that would enable us to map the knowledge-seeking behaviours of participants in the two ecosystems. The surveys collected data on four elements of the respondent's knowledge-seeking: who they contacted; the importance of the interaction; how often interactions occurred (frequency); and the type of information being sought (i.e. business/market/financial information or product/scientific/technical information). The frequency of communication (i.e. phone, face-to-face, and electronic) was based on the previous year's activities, while importance was ranked using a seven-point Likert scale. Respondents described who they were seeking knowledge from based on given categories of ecosystem actors (i.e. entrepreneurial firm, support organization, venture capital/angel network, financial institution, university/college/research, accounting firm, law firm, and government agency).

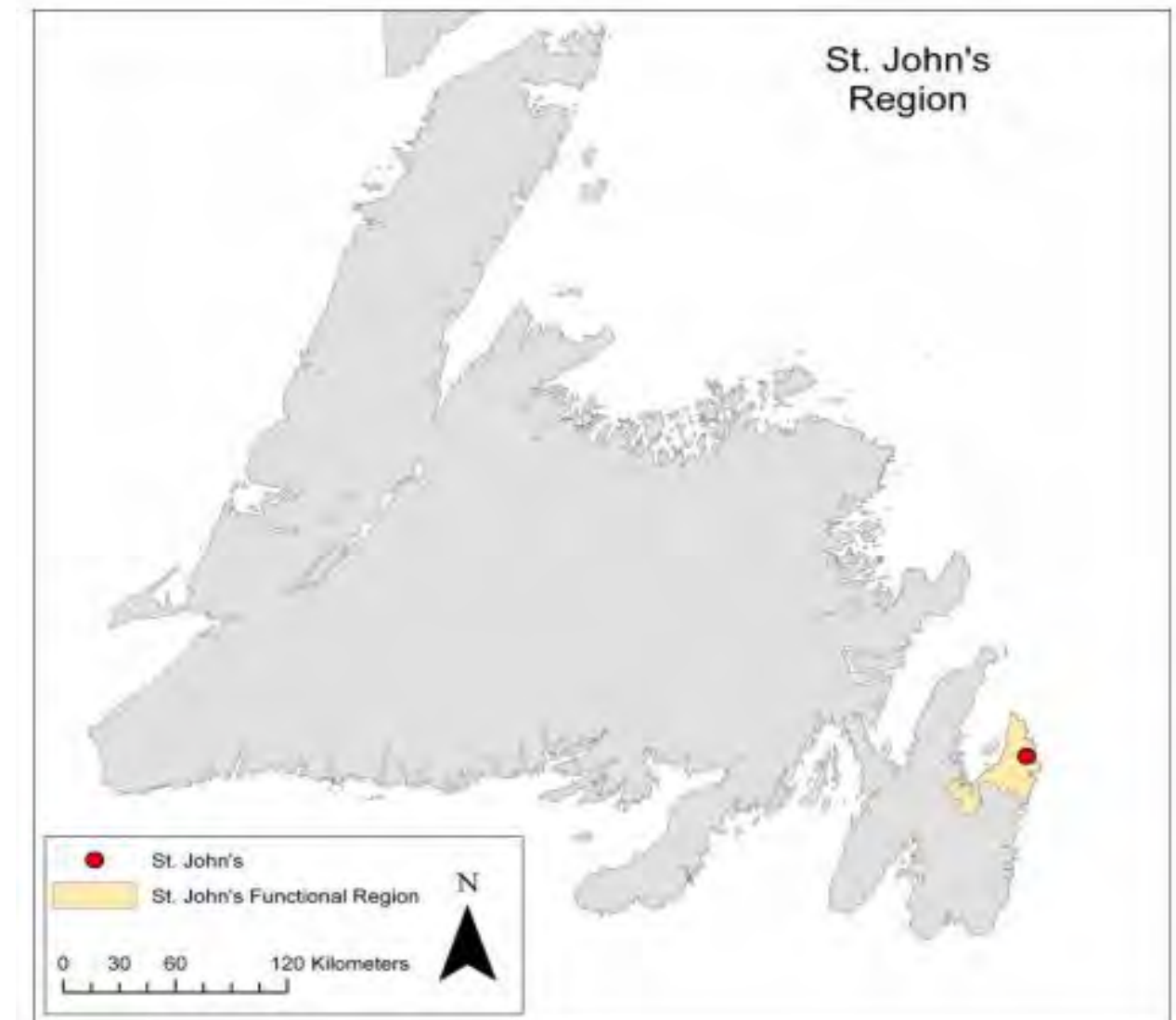
This study was focused on two urban regions, Corner Brook and St. John's, on the island portion of the province of Newfoundland and Labrador. These regions are based on the Functional Economic Regions, defined by Freshwater, Simms, & Ward (2014) as an area delineated by the commuting patterns of people working/living in the locality. The St. John's functional region is the largest urban centre in the province, and includes all of the Northeast Avalon. Both, though quite different, are examples of regions within the province capable of sustaining entrepreneurial ecosystems. St. John's is one of Atlantic Canada's 11 urban centres and Corner Brook is one of 29 Atlantic Canadian small cities

and regional towns (Freshwater, Simms, & Ward, 2014). The regions were selected based on the premise that the research could provide recommendations for strengthening each and that they likely had good comparability to other similarly sized regions in Atlantic Canada.

St. John's is located on the Avalon Peninsula at the province's eastern end (see Map 1 for details). In 2011 the St. John's region (Northeast Avalon) population was 203,325. The population increased 8.0% between 2006 and 2011 (Community Accounts, 2018). The median age in 2011 was 40 compared to 44 for the province. The region's income per capita in 2013 was \$39,800, the province average was \$34,500 (Community Accounts, 2018). Key occupations include sales and service, business, finance and administration, education, law, and government services.

Corner Brook is a regional centre on the island's west coast (see Map 1 for details). In 2011 its population was 41,125, which represents an increase of 0.4% since 2006 (up from 40,970). Over the same period, the entire province experienced a population increase of 1.8% (Community Accounts, 2018). The median age in the region was 46 and average income per capita was \$31,600 for 2013 (provincial average \$34,500) (Community Accounts, 2018). Occupations with the highest employment included sales and service, trades, transport and equipment operators, education, law, and government services.

Map 1: St. John's and Corner Brook Regions



Source: Office of Public Engagement

The surveys were sent in two rounds, in a modified snowball sampling process, and completed between October 2016 and June 2017. There was no single readily accessible list of ecosystem actors, so choosing potential survey respondents was based on researcher and key informants expertise. Initially respondents were drawn from the local entrepreneurial community and then further respondents were drawn from government officials, entrepreneurial support organizations, and universities/colleges. A drawback of this approach was the possibility of missing key ecosystem participants, though it is likely that most of those missed were named in the first round and contacted in the second survey round. As when initial survey participants named new actors they were then sent a survey in the second round (only, though, after their contact details were obtained through public sources). Originally surveys were sent as a fillable PDF document, however, some difficulties were discovered in participants' ability to complete the survey using this format, so a web-based survey was developed and used by most respondents (see Table 1 for details). Ultimately 156 surveys were completed by 51 respondents in

Corner Brook and 105 in St. John's (Table 1 summarizes the survey responses from both regions).

Table 1: Completed Surveys (Web and PDF based)

Corner Brook Web	35
Corner Brook PDF	16
Corner Brook Total	51
St. John's Web	67
St. John's PDF	38
St. John's Total	105
Overall Total	156

All survey emails were addressed to respondents under the principal investigator's (Blair Winsor) name/email for the St. John's portion of the study and the co-investigator (Ken Carter) for Corner Brook in order to take advantage of their relationships in the respective ecosystems and to add credibility to the survey invitation. Both the PDF surveys and the web-based surveys were exported to a CSV file. The data was then cleaned by the researchers/research assistants and coded.

In the second phase of the research methodology the data was analyzed using Gephi software employing proven and generally accepted social network analysis techniques (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008; Borgatti, Everett & Johnson, 2018; Lambiotte, Delvenne, Barahona, 2015). The software created edges (or lines) for each transaction/response in the dataset showing connections between any two nodes (i.e. actors in the ecosystem: entrepreneurial firm, support organization, venture capital/angel network, financial institution, university/college/research, accounting firm, law firm, and government agency). The nodes named by different respondents were consolidated in a map where size and centrality reflects the node's importance and frequency to knowledge seekers within the ecosystem. Each actor type was coded with a unique colour. The resulting maps (see Appendix 2 for examples) show the region's knowledge flows and highlight the central players in these knowledge flows.

Clearances

The project was initially vetted and approved through Memorial University's Interdisciplinary Committee on Ethics in Human Research on March 3, 2016. In accordance with requirements, this approval was extended by the same body annually for the project's duration.

Project Findings

Turning to the findings, as noted above, we received 156 survey responses with respondents naming 393 different entities or nodes (see Table 2). A total of 1021 knowledge-seeking transactions - edges - were listed by respondents, 329 in the Corner Brook responses and the remaining 692 in the St. John's responses. The survey asked respondents the number of times people connected (frequency) and the significance they attached to this knowledge seeking (importance). The average degree is the arithmetic mean for the number of degrees which each node possesses. The degree value is simply the sum of edges (in either direction i.e. both inbound and outbound) for any given node. These values ranged from 1 all the way to 85 (for the Atlantic Canada Opportunities Agency (ACOA) – see Appendix 2), with the average being 5.24. The average weighted degree is calculated by multiplying every nodes degree value by their respective weights. Every edge contains two different values for weight, "importance" and "frequency", these are both numbers from 1-7. For weighted degrees by importance the range in the data is 1 to 489, and when weighted by frequency it is 1 to 228.

Table 2 – Ecosystem Statistics Network Descriptives

	CB	SJ	All
Nodes	178	264	393
Edges	345	692	1029
Average Degree	3.876	5.242	5.24
Average Weighted Degree (Importance)	10.433	14.208	14.16
Average Weighted Degree (Frequency)	5.944	7.644	7.73

The nature of the respondents' profession was also captured (See Table 3 for details). Respondents self-identified on this topic and could include more than one category. Most of the respondents were entrepreneurial firms (54.9% Corner Brook and 49.5% in St. John's). The next largest group was government (25.5% in Corner Brook and 19.0% in St. John's).

Table 3 - Self Identification of Profession (More Than One Category Possible)

	Corner Brook		St. John's		Total	
	Number	Percent	Number	Percent	Number	Percent
Entrepreneur	28	54.9	52	49.5	80	51.3
Social Entrepreneur	8	15.7	12	11.4	20	12.8
Aboriginal	8	15.7	1	1.0	9	5.8
Venture Capitalist	0	0	6	5.7	6	3.8
Private Individual	3	5.9	5	4.8	8	5.1
Business angel network	3	5.9	2	1.9	5	3.2
Lawyer	1	2.0	3	2.9	4	2.6
Accountant	3	5.9	5	4.8	8	5.1

Government representative	13	25.5	20	19.0	33	2.1
Consultant	2	3.9	16	15.0	18	11.5
Journalist	2	3.9	1	1.0	3	1.9
Professor	6	11.8	6	5.7	12	7.7
Employee in a mature company	3	5.9	9	8.6	12	7.7
Research laboratory employee	1	2.0	2	1.9	3	1.9
Banker	0	0	0	0	0	0
Other (please specify below)	9	17.6	14	13.3	23	14.8

Respondents reported high education levels with all but two having had some form of post-secondary education (Table 4 outlines the respondent's educational profiles). Combined, nearly a quarter of all respondents had a master's degree, while more than half had a bachelors' degree. Ecosystem participants in both regions are then highly educated.

Table 4 – Respondent Educational Profile

	Corner Brook Percent	St. John's Percent	Total Percent
High School or Equivalent	24	15	18
Some College	12	5	7
Vocational/Technical School (2 years)	14	7	9
Bachelor's Degree	45	56	53
Master's Degree	24	26	24

Note: Percentages will not add to 100% due to more than one response from individual respondents.

Much of the data is usefully presented on network maps (or graphs) (see Appendix 2). These maps show all the nodes named by respondents and the type and direction of their knowledge seeking. In these maps centrality and node size represent frequency and importance. An examination of these maps reveals that university/college and research, government agencies and support organizations are very important in both ecosystems (see Table 5 and Appendix 2). Most have large node size and are located in the central portions of the maps with multiple edges going in both directions. Financial institutions are well represented. Venture capital/angel firms, law firms, and accounting firms are more prominently seen in St. John's (see Appendix 2 maps). Also noteworthy was the very small number of nodes outside the region and beyond, evidence of the insularity or narrowness of much of the knowledge seeking in both regions. A striking feature on both regional maps (see Appendix 2 and Table 5) is the often peripheral location of

entrepreneurial firms, many are located on the outer portions of the maps and have few edges with their entrepreneurial firm peers.

Table 5 - Node Type and Importance of Inward/Outward/Combined Knowledge Seeking

Node Type	Weighted (importance) In Degree	Weighted (importance) Out Degree	Weighted (importance) Combined
University/College/Research	27.81	45.81	73.63
Government Agency	26.13	16.00	42.13
Support Organization	16.71	19.75	36.47
Financial Institution	27.75	0.63	28.38
Venture Capital/ Angel Network	24.29	2.29	26.59
Entrepreneurial Firm	6.26	13.42	19.68
Accounting / law firm	13.74	3.98	17.72

Given our focus on the knowledge seeking of entrepreneurial firms it is important to delve into this aspect of the data. In particular, the kinds of information being sought by entrepreneurial firms. The survey asked respondents to distinguish between business/market/financial versus product/service/technical or a combination of both, and whether they were seeking knowledge from entrepreneurial firms or others in the ecosystem (see Tables 6.0 and 6.1). Especially noteworthy here was how little knowledge seeking occurred between entrepreneurial firms. They sought knowledge 441 times and of these only 104 (less than 25%) were from other entrepreneurial firms (see Table 6.0). Also interesting was the split between types of knowledge sought, entrepreneurial firms were seeking business/market/financial knowledge about three times more often than product/service/technical knowledge whether the inquiry was directed at other entrepreneurial firms or any other entity (see Table 6.0 & 6.1).

Table 6.0 – Total Knowledge Seeking by Entrepreneurial Firms

	Business/Market/Financial	Product/Service/Technical	Both	Neither	Total
SJ All KS	210 (55%)	50 (13%)	96 (25%)	25 (7%)	381
CB All KS	31 (52%)	6 (10%)	8 (13%)	15 (25%)	60
Total KS	241 (55%)	56 (13%)	104 (24%)	40 (9%)	441

Note: CB = Corner Brook; KS = Knowledge Seeking; SJ = St. John's

Table 6.1 – Entrepreneurial Firm to Entrepreneurial Firm Knowledge Seeking

	Business/ Market/ Financial	Product/ Service/ Technical	Both	Neither	Total
SJ E To E KS	38 (44%)	10 (12%)	36 (42%)	2 (2%)	86
CB E to E KS	5 (28%)	4 (22%)	3 (17%)	6 (33%)	18
Combined KS	43 (41%)	14 (13%)	39 (38%)	8 (8%)	104

Note: CB = Corner Brook; E = Entrepreneurial Firm; KS = Knowledge Seeking; SJ = St. John's

This data was thought provoking and raised a number of intriguing points which are discussed in the next section.

Discussion

Examining and reflecting on the findings reveals a number of points. Firstly, encouragingly, overall both regions have, arguably, many of the organizations and people needed for a thriving entrepreneurial ecosystem (Malecki, 2018; Spigel, 2017; Stam, 2015). Each region has evidence of entrepreneurial firms, support organizations, venture capital/angel network presence, financial institutions, venture capital/angel investors, higher education facilities, accounting and law firms, and government agencies, all of which appear to be playing, generally, a positive role. Using Cukier et al's (2015) four stage schema, our preliminary sense of the two ecosystems suggests both are currently in the evolving stage, with St. John's a little further developed as evidenced by the stronger roles of venture capital and support organizations in that region.

Not unexpectedly the data does not indicate great differences between the two ecosystems and therefore we are combining the data for both in this section. However, there are a few notable differences. Corner Brook has a substantially higher self-identification of aboriginal background compared to St. John's. This is not surprising given the number of residents of the region who were members of the Qalipu First Nation. Another difference is that Corner Brook lacks venture capitalists compared to St. John's which is likely a function of the region's smaller size. However, more respondents in Corner Brook identified as part of a business angel network which would likely compensate somewhat for the lack of venture capital funding availability in the ecosystem. There were also more respondents in St. John's who identified as consultants.

Secondly, most troubling is what appears to be a lack of interaction among entrepreneurial firms in both regions. There are good examples of entrepreneurial firm driven networking organizations in both regions, including Startup NL and Common Ground in St. John's as well as Humber Valley Entrepreneurs in Corner Brook. However, our data does not show entrepreneurial firms seeking knowledge from their peers as

much as from support organizations, with less than 25% of knowledge seeking by entrepreneurial firms directed to other entrepreneurial firms (see Tables 6.0 & 6.1). This low level of peer to peer knowledge seeking is contrary to the emphasis in the available literature that suggests entrepreneurial firms are crucial in helping other entrepreneurial firms both build their businesses and the ecosystem (Feld, 2012; Napier and Hansen 2011; Isenberg, 2010).

Thirdly, the responses (See Table 6) had significantly higher knowledge seeking behavior related to business/market/financial knowledge (55%) rather than product/service/technical (13%), though a number of respondents referenced both (25%). This raises a number of questions. By not seeking product/service/technical knowledge as much as business/market/financial, is the data suggesting that our entrepreneurial firms are not as innovative focused as they could be or do not have the internal knowledge needed to recognize the value of this external knowledge? After all innovation, arguably, requires product/ service/technical knowledge (Cohen & Levinthal, 1990; Grimpe & Sofka, 2009; Laursen & Salter, 2006; Wang, 2011). Do these findings of lower technical knowledge seeking, added to the substantial presence of government in each ecosystem, suggest that the ecosystems are too dependent on government business/market/financial support? Is the government presence also related to our entrepreneurial firms pursuing government funding and, if so, does this point to an immaturity in the island's ecosystems when compared to regions in the world that attract large amounts of venture capital or is this normal for peripheral regions? More work is needed to address these questions.

Fourthly, the level of entrepreneurial firm-to-mature firm interaction was lower than expected based on information from established ecosystems (Saxenian, 1996). The maps of the two ecosystems show few connections between newer entrepreneurial firms and mature firms. The issue here may be the complexities of power relations (Mayoux, 2001; Wang, 2011) where smaller startups may feel intimidated by large successful firms. Arguably, each region's mature firms have significant expertise and capacity to help their region's entrepreneurial firms (Alvarez & Barney, 2001). This suggests that more needs to be done to include the expertise of mature firms in ecosystem activities. Similarly, there was also limited connections to venture capital, with venture capitalists outside the centre in both the St. John's or Corner Brook maps. This may change as the ecosystems mature and deal flow increases.

Fifthly, in addition to government, the maps show that entrepreneurial firms were also seeking knowledge from university/colleges and support organizations. Entrepreneurial respondents referenced the College of the North Atlantic, Memorial's St. John's and Grenfell Campuses, as well as support organizations such as NLOWE, Futurpreneur and the Community Business Development Corporations. The degree of centrality for these institutions as well as node size reflect the frequency and importance of these connections for ecosystem participants (see maps Appendix 2). In addition to government, other support organizations are also important sources of capital for entrepreneurial firms which may tend to skew the knowledge seeking to business/market/financial rather than product/service /technical. Overall, these results tend to show these organizations expected ecosystem role.

Finally, also troubling was that both ecosystems lack many external connections beyond their regions. Survey respondents seldom referenced connections across Atlantic Canada and even fewer referenced any beyond Atlantic Canada to the rest of the world. There was some evidence of actors reaching outside the ecosystem to the broader Atlantic region and beyond (e.g. MARS, Build Ventures). However, there was not as much of this as might be expected in a healthy ecosystem. This suggests weak connections between the two ecosystems to Atlantic Canada, North America, and the rest of the world. Within the province, Corner Brook and St John's appeared to be well connected but both ecosystems connections are island centric. There were a few notable exceptions, both of very well connected individuals and to particular places (e.g. evidence of links to the Caribbean in St. John's likely stemming from a project driven by the Newfoundland Environmental Industry Association). Interestingly, this finding of limited connections beyond a region is consistent with the finding from the recent Halifax ecosystem mapping project (Farrell & Dennison, 2015). The literature on innovation systems notes the importance of external connections to new ideas circulating into the ecosystem, and with limited connections beyond the province we are not likely to be participating fully in global innovation processes (Bathelt, Malmberg & Maskell, 2004; Rodriguez-Pose, 2010).

Knowledge Mobilization

This project was part of a broader Atlantic Canadian partnership that includes St. Mary's University, Memorial University of Newfoundland, Cape Breton University, University of Prince Edward Island and Universite de Moncton. The cooperating universities have held workshops in Halifax, Charlottetown, and Corner Brook. The Corner Brook workshop took place in April 2017 and included 50 participants from the local ecosystem. An additional session is planned for St. John's in partnership with the Memorial University's Harris Centre. As data becomes available across Atlantic Canada more sessions comparing and sharing research are planned. Findings for Atlantic Canada, including St. John's and Corner Brook, were shared at the Global Consortium of Entrepreneurial Centers in Halifax in the fall of 2017.

Recommendations

The literature on ecosystems and knowledge seeking by firms highlights key elements of successful regions and innovative firms. Based on this literature, there were several expectations formed at the beginning of this study. The first of these was that there would be considerable university/college knowledge search by entrepreneurial firms. This was confirmed through the interviews, with Memorial University's, St. John's and Grenfell Campuses, and College of the North Atlantic, all prominent players in knowledge seeking by entrepreneurs. Second, we expected to find considerable entrepreneurial firm-to-entrepreneurial firm knowledge seeking, however we found much less than anticipated. Third, we expected to find good knowledge seeking beyond the local ecosystems and

into Atlantic Canada, North America and beyond. Again, less of this was found than anticipated.

Reflecting on our findings we would make the following recommendations to actors in both ecosystems.

- 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 and their local entrepreneurial organizations. At the same time, they should maintain their knowledge seeking relationship with support organizations and others in the ecosystem.
- Support organizations should consider funding and/or strengthening entrepreneurial networking (e.g. in addition to providing information themselves they should direct knowledge-seeking entrepreneurial firms to other entrepreneurial firms).
- Support organizations might also try to react to entrepreneurial firms rather than be as proactive as they have been (e.g. waiting for them to request knowledge rather than trying to anticipate their needs and, in effect, running the risk of shaping, inadvertently, knowledge seeking activities by their actions).
- Support organizations and universities/colleges could organize events that bring mature firms and venture capital firms in regular contact with entrepreneurial firms and their ecosystem. These could include hosting hackathons and inviting the firms, hosting networking events for entrepreneurial, venture capital and mature firms.
- Mature firms could make more effort to interact/mentor entrepreneurial firms in their regions. Examples of how they could help include: supporting startups through including them in their R&D efforts, hosting hackathons; providing office hours whereby entrepreneurial firms could speak to mature firms, lending resources and/or expertise to entrepreneurial firms, buying products from them, introducing entrepreneurial firms to suppliers, customers, and industry partners, and assisting with the testing of prototypes.
- All ecosystem actors should look to expand extra-local knowledge seeking, e.g. new international linkages could be shared with other ecosystem participants to forge new regional links to extra-local places, combining resources to attend trade missions and trade shows.

Conclusions

This work has led to the first micro-level quantitative understanding of the nature and extent of knowledge seeking in the evolving St. John's and Corner Brook entrepreneurial

ecosystems. Key data from over 150 respondents representing a variety of ecosystem actors has been presented. The data was analysed, based on social network analysis, and recommendations were made based on this analysis.

In terms of future work, with this preliminary underlying data set gathered for the St. John's and Corner Brook ecosystems, new opportunities arise for further research. This will include further comparisons geographically with work being undertaken across Atlantic Canada. Similar studies are taking place in PEI, Cape Breton and New Brunswick and a study based in Halifax has been completed. As all these studies are completed, comparisons of these data sets will be a priority. More work needs to be done comparing rural results to urban centres across the region. The data also will allow data mining based on gender, age, stage of growth and industry sector. Taken together this represents an ambitious research program that can give significant insights into the current state of entrepreneurship in Atlantic Canada. There is also the possibility to redo the work after a period of years to determine what changes have occurred in the ecosystems.

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Appendix 1: Survey Instruments

Appendix 2: Ecosystem Maps

Quantitative Analysis of the Atlantic Entrepreneurial Ecosystem's Innovation Activities

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Abstract

In nature, ecosystems occur when organisms network and interact resulting in value creation, and the total of the value generated exceeds the sum of its parts. Business ecosystems define economic communities participating to create opportunities that exceed those of any one of the organizations alone. Overholm (In press) points out that there is a lack of ecosystem research regarding start-ups role(s) (as opposed to established industries) within ecosystems and a lack of research regarding new ecosystem formation. This study addresses the young firms in the Atlantic entrepreneurial ecosystems using novel network theory. Data was collected from the ecosystem about innovation-driven knowledge-seeking behaviours. The work's contribution is significant in that it applies highly quantitative methods to develop highly visual and easily interpreted results. It adds to the qualitative contributions of the world's leading scholars in regional comparative advantage. Policy makers and ecosystem constituents can readily observe the nature of the patterns within the ecosystem allowing important interpretations.

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Introduction

Interest in entrepreneurial ecosystems has intensified with the acceleration of the importance of entrepreneurship and with the success attributed to specific locations such as Israel, Silicon Valley, Route 128 in Massachusetts, as examples. The discussion has principally focussed on historical ethnographic account of the interactions of personalities, events, the actions of various companies, the recycling of talent, and the composition of a variety of different types of actors and groups in the ecosystem. The research outlined in this report responds to the need to study the dynamics of differing entrepreneurial ecosystems and the investigation of their context and institutional characteristics (Autio, Kenney et al. 2014). We measure the knowledge-seeking behaviours of participants in an ecosystem and chart them using network theory. Stripping away various elements of the ecosystem shows the relative importance of the remaining actors. The results demonstrate that the ecosystem performs better when all of the components are contributing; network average degree weightings decline when any of the supportive constituents is missing. The work contributes to understanding the relative relationships in this ecosystem and suggests implications for comparison work with other regions.

The paper proceeds as follows. First we discuss the study's purpose and the call for quantitative measures based on the historic contributions to regional advantage and entrepreneurial ecosystems. The previous research is a bridge to a description of the emergence of the Atlantic entrepreneurial ecosystem (AEE) and its acceleration over the past decade. The methodology for studying the ecosystem follows; sub-sections outline the type of study, the sampling methodology, the survey protocol and type of analysis. The descriptives of the respondents are included there. This is followed by the results, including network charts and tables of measures. The paper concludes with a discussion of the implications, limitations and opportunities of this methodology.

Study Purpose

Entrepreneurial ecosystems encompass numerous variables including a combination of community, success, concentrations of university talent, growing pools of venture capital funding, and adept abilities to adopt new paradigms (Saxenian 1994). Other than the ethnographic, historical accounts and case studies noted earlier, some of the work highlighted models illustrating the flow of activities amongst the groups (i.e. Bahrami and Evans 1995; Ferrary and Granovetter 2009), and economic models using expenditure and investment data (McCann 1997). In studying ecosystems, Autio, Kenney et al. (2014) created a framework for investigating entrepreneurial ecosystems within the context of the industry, technology, social policy and organizational context, and related

policy concerns, and also including temporal and global, national and regional innovation systems. Some ecosystem research is based on survey data of measurements such as location decisions (Galbraith, Rodriguez et al. 2008), and interpretive analysis resulting in theoretically constructed propositions (Honig and Black 2007). A longitudinal analysis of inventor networks highlighted the emergence of clusters and networks in specific industrial classifications (Ter Wal 2013).

The purpose of this study is to investigate the relationships amongst various groups of actors within an entrepreneurial ecosystem in a more structured manner by using network theory. This shows the distribution of information-seeking activities as well as quantitative measurements amongst the constituents. This study heeds recent calls to introduce context by avoiding focus on the firm or the entrepreneur (Autio, Kenney et al. 2014). We conduct this study using an entrepreneurial ecosystem located on the east coast of Canada where the foci are a number of small provinces that are sparsely populated. This is in sharp contrast to the extant methodologies studying the context of entrepreneurial ecosystems.

Regional Advantage

Entrepreneurial innovation is thought to be a competitive advantage of a nation (Baumol, 2002). Yet nations can be large, and smaller regions have come to dominate success in entrepreneurial innovation. Concentrated systems of entrepreneurial innovation in specific regions has spawned the terminology of entrepreneurial ecosystems. The term goes back beyond 1995 (Bahrami and Evans 1995) where the most famous entrepreneurial ecosystem in the world, Silicon Valley, was characterized by “fleeting opportunities, shifting customer preferences, cascades of technological innovations, brutally short product life cycles, and furious global competition” (p. 62).

In the 20 intervening years, entrepreneurial ecosystems have evolved to represent “networks of actors contributing to joint value creation” and that had “undertaken some degree of co-innovation or adaptation” (Overholm In press). Now, the study of networks based on social constructs are far more prevalent (Pentland 2014) and knowledge-exchange systems that are defined by cooperation need not be spatially proximal or have a local context. This work adopts a general term of entrepreneurial ecosystem to describe a system that has elements of co-location and clustering, but that can also have the far reaching element of networks and innovation systems.

While there is a tendency to place successful ecosystems within their current day context, most of the former, and currently successful, systems have roots well back into the 1940’s and 50’s and for some, beyond that. The success of regionally-based entrepreneurship undertakings focussed attention on locations such as Silicon Valley, Route 128 in Massachusetts, Start-up Nation Israel, Silicon Glen in Scotland and Sophia-Antipolis in France are just a few. Some attention has been paid on less-than-successful locales (Honig and Black 2007) as well.

The contributions made by innovation and entrepreneurship to these highly successful regions is of interest to other regional economies that are attempting to facilitate similar commercial outcomes. However, the results of imitators have been inconsistent at best (Engel 2015) which has perpetuated an interest in entrepreneurial ecosystems. In nature ecosystems occur when organisms network and interact resulting in value creation, and the total of the value generated exceeds the sum of its parts. Business ecosystems define economic communities participating to create opportunities that exceed those of any one of the organizations alone. Overholm (In press) points out that there is a lack of ecosystem research regarding start-ups role(s) (as opposed to established industries) within ecosystems and a lack of research regarding new ecosystem formation.

The methods of these works have principally focussed on historical ethnographic accounts of the interactions of personalities, events, the actions of various companies, the recycling of talent, and the composition of a variety of different types of actors and groups in the ecosystem. More quantitative approaches have been encouraged in order to contribute a different lens to the highly insightful and subtle qualitative observations made by significant scholars in the area (Engel 2015; Overholm In press).

Atlantic Entrepreneurial Ecosystem

The AEE is on the east coast of Canada with a hub in Halifax Nova Scotia and another in Fredericton, New Brunswick, two small sparsely populated provinces. The provinces of Prince Edward Island and Newfoundland and Labrador round out what is referred to as Atlantic Canada. With approximately three percent of the nation’s population, the region suffers difficulties. The most populous province, Nova Scotia (population of 943,000 (2014)) has a declining birth rate as well as a declining population. The number of births in the Province dropped by 6 percent between 2010-2014.

Traditionally focussed on fishing, forestry, and some large industrial pulp and paper and tire manufacturing plants, the sources of these higher paid skilled labour positions are diminishing. One large pulp and paper manufacturer is closed and another faces a precarious future with odour levels that are challenging to correct. One of Michelin’s major tire plants has announced its closure. The current trend sees many families supported by Nova Scotians working in oil fields in western Canada and commuting between Alberta and Nova Scotia on a three- to six-week schedules. More recently, the declining price of oil raises concern about even this form of employment. In February, 2015 Alberta lost 14,000 jobs (Babad 2015), many of them expected to be migrating workers from Nova Scotia but the outpouring of youth to western Canada is expected to continue with an improvement in the oil and gas industry (Babad 2015).

Proportionately less is spent on R&D expenditures in Nova Scotia than the Canadian averages. Nova Scotia’s private sector R&D expenditures (\$505 million) are well below the Canadian average (2014). Canada-wide, private business R&D expenditures contribute 50 percent of the total on average. In Nova Scotia only 16 percent is contributed to R&D expenditures by private business (2014). This point is further

emphasised when the Province's gross expenditure on research & development is expressed as a percentage of gross domestic product. This percentage is only 1.3% for Nova Scotia as compared to 1.8% for Canada.

Yet the Province is very well suited to see significant growth in its GDP by transitioning towards a knowledge based economy. In recent years the foundation for this has been facilitated by the urbanization of the population, as well as the Province's high levels of post-secondary education. With 10 universities, and 13 community college campuses, Nova Scotia produces more post-secondary graduates per capita than any other Canadian province. All three levels of Canadian government have begun to devote resources to encourage growth in the local innovation ecosystem.

Halifax, Nova Scotia's capital city, is the largest population centre in Atlantic Canada and is home to 43 percent of the Province's residents (2014). The city has been recently experiencing a growth in university enrolments that are twice the national average. This strong academic presence contributes significantly to the R&D expenditures in the region, accounting for 74 percent of the total (2014).

With some of Canada's oldest and top rated universities, Halifax is turning a focus towards entrepreneurship, and the knowledge transfer from academia to the private sector. There has long been a foundation of support organizations, from the private sector such as Entrepreneurs Forum (founded 1992), from the federal government such as Atlantic Canada Opportunities Agency (formed 1987), and from the Provincial government with Innovacorp (formed 1994), in the city. By 2000, there were a number of government (Innovacorp, NSBI, Investment New Brunswick) and private venture capital (ACF) options in the region, and more were to come. Entrevestor, an online news service, was founded with the help of local governments, and it follows the developing entrepreneurial ecosystem, with an explicit focus on technology-enabled high growth firms.

The emerging ecosystem saw tremendous growth in the aftermath of a \$350 million exit and \$640 million exit (reputed) of two entrepreneurial firms in the Region, in New Brunswick. Radian 6 and Q1Labs had similar founders, investors and were both ICT firms. Respectively, they were sold to Salesforce.com and IBM. In 2012, Halifax-based firm, GoInstant, also sold to Salesforce.com. These and the earlier sale of CanStockPhoto and later, Compilr, developed a flow of capital into the region, and some of the founders and early investors recycled their new wealth into the founding of incubators (Volta Labs), accelerators (Launch 36), university support systems (Pond Deshpond Centre) and innumerable programs and pitch contests to encourage entrepreneurship.

The longstanding entrepreneurship program at Saint Mary's University, a major business school in the country, was then supported by Dalhousie University's Starting Lean course and a new Masters in Technology Entrepreneurship and Innovation at the Sobey School of Business.

Methodology

The methodology to effectively measure and map an ecosystem quantitatively is best undertaken with a field study of the knowledge-seeking behaviours of constituents of an entrepreneurial ecosystem. Knowledge-seeking is the measure of innovative behaviour. Using a snowball sampling method, a survey investigated the knowledge-seeking behaviours of constituents of the ecosystem as well as the importance and frequency of the ecosystem's participants' knowledge-seeking activities. The data was analysed using network theory. A more detailed description follows.

Measures

Alvarez and Barnery (2007, p 126) noted that the central measure used in the opportunity literature were "actions that entrepreneurs take to form and exploit opportunities," but not all entrepreneurial actions are innovative (Bosma, 2009). So where performance is driven by entrepreneurial innovation which is a function of entrepreneurial behaviour (Autio, Kenney et al. 2014) knowledge-seeking behaviours were used as the best indicator for entrepreneurial innovation.

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. Three dimensions were investigated regarding each knowledge-seeking activity: importance, frequency and type of information sought. The number of times an ecosystem member reached out to someone else was measured, and the importance of the information to the seeker was measured with a seven-point Likert scale. The types of information sought were assessed as either business/market/financial information or product/scientific/technical information.

The survey protocol was executed by means of a "fillable form" survey. Returned surveys implicated other companies which were then sent a survey regardless of their physical proximity to the respondent. This type of survey distribution was adopted to avoid services such as Survey Monkey to ensure that the process of exporting data from the surveys occurred on servers owned, and operated, by Saint Mary's University, as opposed to an independent third party. By ensuring that this data was only retained by the University we were able to better ensure the confidentiality of all personal information collected.

Sample Selection

The sample began with a list of qualified potential respondents drawn from media sources within the entrepreneurial community of Atlantic Canada. The technique of using snowball samples, or respondent-driven sampling, is appropriate for network analysis (Biernacki, 1981). With respondent-driven sampling, respondents indicate

persons from whom they sought advice/information/knowledge about entrepreneurial ventures. The individuals noted by each respondent become the source for enlarging the sample and developing new potential respondents.

There is no list *per se* of all entrepreneurs and all firms and all agencies providing services to entrepreneurs so the boundaries are estimated by the participants of the snowball sample. Using this method, it is possible to access hidden agents participating within the Entrepreneurial Ecosystem. It is also recognized some influencers will not be part of the sample.

To develop a targeted distribution list for the AEE survey a base list of 75 qualified respondents was compiled. These included individuals in organizations that composed the various constituent groups in the ecosystem such as entrepreneurs, venture capitalists, incubators, governments agencies, supportive organizations and others. The list of qualified respondents was generated by carefully evaluating personal contacts of the lead researcher, Entrestor (an entrepreneurship news service), AllNovaScotia.com (a business news service), and the online networking site, LinkedIn.ca. Those identified by these sources were the initial recipients of the survey. This distribution grew from the initial group of recipients, to 450 recipients in the first week, and snowballing to, and concluding with, 886 recipients after the final (fourth) week of distribution. A large proportion of the final group were not in any physical proximity to the Atlantic region.

Data Collection

All emails were addressed to respondents under the principal author's email to take advantage of her name recognition and to add academic credibility to the requests. Most data was obtained in pdf fillable forms and was exported to a csv file. Therefore, information provided by emailing the fillable form populated the database automatically. Cleaning and coding the data was took place. The data are analysed using the complex network theory program, Gephi (Cherven 2013).

Network theory creates *arcs* for each knowledge-seeking behaviour between two *nodes* which are the seeker and the responder. Duplicate nodes are consolidated to produce a network graph which introduces the concept of centrality in network theory. The type of information sought was also recorded. Because the entrepreneurial network data is from various types of constituents (venture capitalists, entrepreneurs, universities, accountants), research assistants manually coded organizational types.

Survey Descriptives

Table 1 describes the response and network descriptive. The survey instrument was responded to by 95 individuals (some of whom declined to participate for specific reasons). The survey was completed by 79 respondents. The total number of different firms to which the respondents referred was 781. A total number of 1477 knowledge-seeking transactions were engaged in by the ecosystem.

Table 1 - Respondent Descriptives

Respondent Descriptives	Count
Individuals responding to survey request (#)	95
Completed Surveys by Individuals (#)	79
Number of firms reported overall	781
Male/Female (%)	75/25

The nature of the respondents' capacities within the ecosystem is outlined in Table 2. Respondents were permitted to self-identify into more than one category. Most of the respondents were entrepreneurs (46.8%) and a class of individuals who reported themselves as consultants (36.7%). As a collection, the next largest group were the venture capitalists (15.2%), the private individual investors (10.1%) and a member of an angel network (1.3%). Professors from the local universities and colleges represented 12.7 percent of the respondents' professions.

Table 2 - Self Identification of Profession (More Than One Category Possible)

Self Identified as	Percent (%)
Entrepreneur	46.8
Venture capitalist	15.2
Private Individual Investor	10.1
Member of Angel Network	1.3
Lawyer	1.3
Government Representative	3.8
Consultant	36.7
Professor	12.7
Employee at a large firm	1.3
Bank Representative	1.3
Mentor	3.8

Professors aside, the level of education amongst the ecosystem is very high. Respondents were highly educated with all but two having had some form of post-secondary education. Combined, more than half of the respondents had a masters' level or a doctorate and 27.1 percent of the group had a bachelors' degree. Fourteen percent of the respondents had a professional designation. Table 3 outlines the educational profiles of the respondents involved.

Table 3 - Level of Education

Level of Education	Percent
High School/Equivalent	2.9
Vocational/Technical School	2.9
Professional Designation	14.3
Bachelor Degree	27.1
Master Degree	42.9
Doctoral Degree	10.0

Results

Three elements of the AEE are dissected in this analysis. The AEE as a whole is assessed along with the functioning of the system when specific groups are removed. That is followed by an analysis of the activities of the entrepreneurs, venture capitalists and universities – three qualities that are always recognized in successful entrepreneurial ecosystems.

Assessment of Entire Atlantic Entrepreneurial Ecosystem

The knowledge-seeking activities of the AEE are numerous and complex. There are 780 different organizations implicated in the reported AEE and 1477 separate knowledge-seeking relationships activities by the 79 respondents. The image of the AEE is displayed in Figure 1. The various types of organizations identified by their colour and a legend displays the number of nodes. Fifty-seven percent of the nodes are represented by entrepreneurial firms. Support organizations, venture capital firms, universities, Federal and Provincial governments, and professional firms represent the bulk of the named organizations that were sought after for some type of knowledge. The size of the node represents the number and importance of the knowledge-seeking behaviours which others sought of the named node. The centrality of a node is an indication of its interconnectedness amongst many different information seekers.

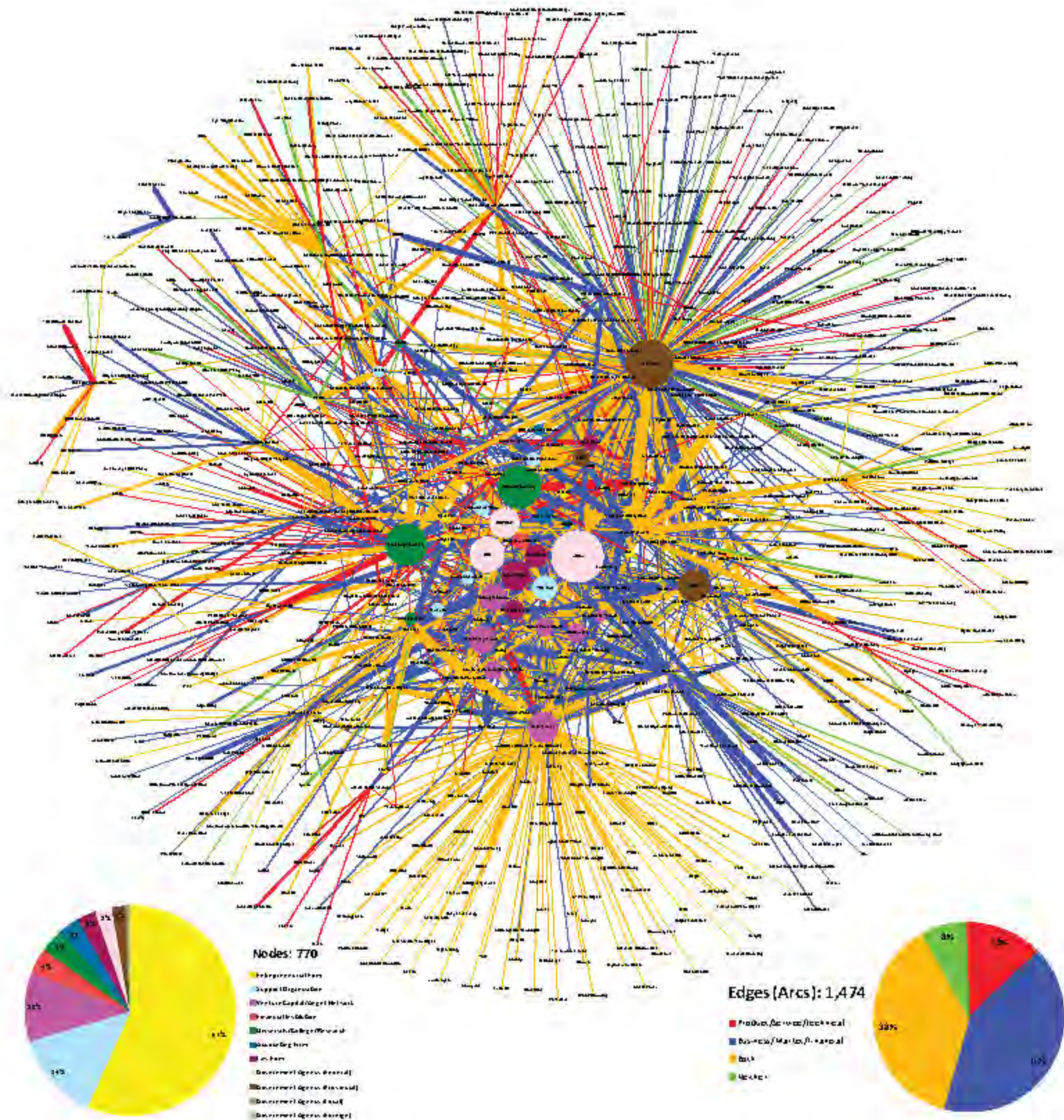
Two key types of information were suggested as the basis for reporting respondents' behaviours. *Product or Service Technical* information indicates science-related, product, programming, equipment, or technical information. Thirteen percent of information requests were of this nature. The legend in Figure 1 displays the types of information sought. Forty-one percent of the requests were for *Business Market or Financial* information which relates to markets, administrations, funds seeking and business operations. Thirty-eight percent of the respondents were looking for both kinds of information from their knowledge-seeking activities and the remaining eight percent indicated they were looking for information other than these two key categories. Careful examination of the arcs reveals numerous other bits of information such as the direction of the information-seeking activity. The small pointed end, terminating on the periphery of a node means the information was *sought from* that organization. Avive Naturals for example has many arcs emanating from theirs. They sought information from Perennia, NSBI, Canada Business Reference Library, Halifax Port Authority, NRC-

IRAP, Export Canada and Port Mexico to name just a few. They, on the other hand, are a very small node because they have not been sought to provide information to others in the AEE.

The major financial institutions, universities, support groups and federal and provincial agencies are very important to the ecosystem. They are more sought-after for information and more connected which drives their nodes it to the centre of the chart. Some entrepreneurial firms that are frequently linked to these organizations are also in the centre of the chart. Many of the firms on the periphery of the chart are those from which information was sought but that have no other knowledge-seeking associations with any other company in the AEE.

A considerable proportion of the knowledge-seeking behaviours of the AEE is not proximal to the Atlantic Canada location. Approximately 75 percent of the nodes are situated in the Atlantic region. Encouragingly, 15 percent of the nodes are from the rest of Canada, nine percent are from the U.S., and one percent are from abroad. This suggests a global group reaching out for information from companies and groups around the world. If these global-facing nodes are connected to entrepreneurs it suggests an inoculation to dis-entrepreneurship as defined by Honig and Black (2007). Dis-entrepreneurship occurs when the community adopts an inward facing orientation rather than an outward orientation in a globalizing world. "Entrepreneurs finding themselves in communities characterized by strong client-patron relations would do well by appealing to broader regional institutions that frequently trump local oligopolies" (Honig and Black 2007. p 286).

Figure 1 – Knowledge- Seeking Activities of the Entire Atlantic Entrepreneurial Ecosystem



Another way of measuring the importance of individual groups of constituents is the proportion of relationships between the edges or arcs (the lines running from node to node) and the number of different constituents (number of nodes). This is called the Average Degree statistic. A larger Average Degree statistic (Arcs/Nodes) indicates that more knowledge-seeking behaviours are taking place per member of the ecosystem.

Table 4: Ecosystem Statistics With and Without Various Ecosystem Groups

	Entire Ecosystem (EE)	EE Minus Federal Participation	EE Minus Provincial Participation	EE Minus Support Orgs	EE Minus University Participation	EE Minus Venture Capital
NODES	770	752	571	633	692	584
EDGES	1474	1369	1059	1145	1282	1045
AVERAGE DEGREE	1.914	1.807	1.855	1.809	1.853	1.789
AVG WEIGHTED DEGREE	12.481	11.669	10.737	12.104	12.172	11.844

Table 4 shows the AEE without various groups of constituents as comparators. The average knowledge-seeking activity decreases when any group is removed from the ecosystem. For example, when the Federal Government’s participation is removed from the AEE, the AEE’s average degree declines from that of the average degree of the whole ecosystem; the entire ecosystem’s knowledge-seeking activity level improves when Federal participation is included. Federal Government constituents punch above their weight in the AEE because the ecosystems’ arcs per node declines when the Federal Government is absent. The AEE is most hampered if the Province is withdrawn likely because of the contribution of government-sponsored venture capital in Innovacorp, NSBI and Build Ventures.

A similar situation occurs when considering all of the other major groups noted in Table 4. Removing any one of them causes the average degree of knowledge-seeking behaviours to decline. The AEE is more knowledge-seeking when all the major groups of constituents are in place.

The average weighted degree takes into account the combined importance weights indicated by the respondents to the survey – the *value* of the information sought by the seeker. A higher value indicates more importance. In Table 4, the Weighted Average Degree of the AEE is 12.481 when everyone is participating. However, the AEE’s average weighted degree declines the most, to 10.737 when the Provincial governments’ contributions are removed (two early-stage venture capital funds).

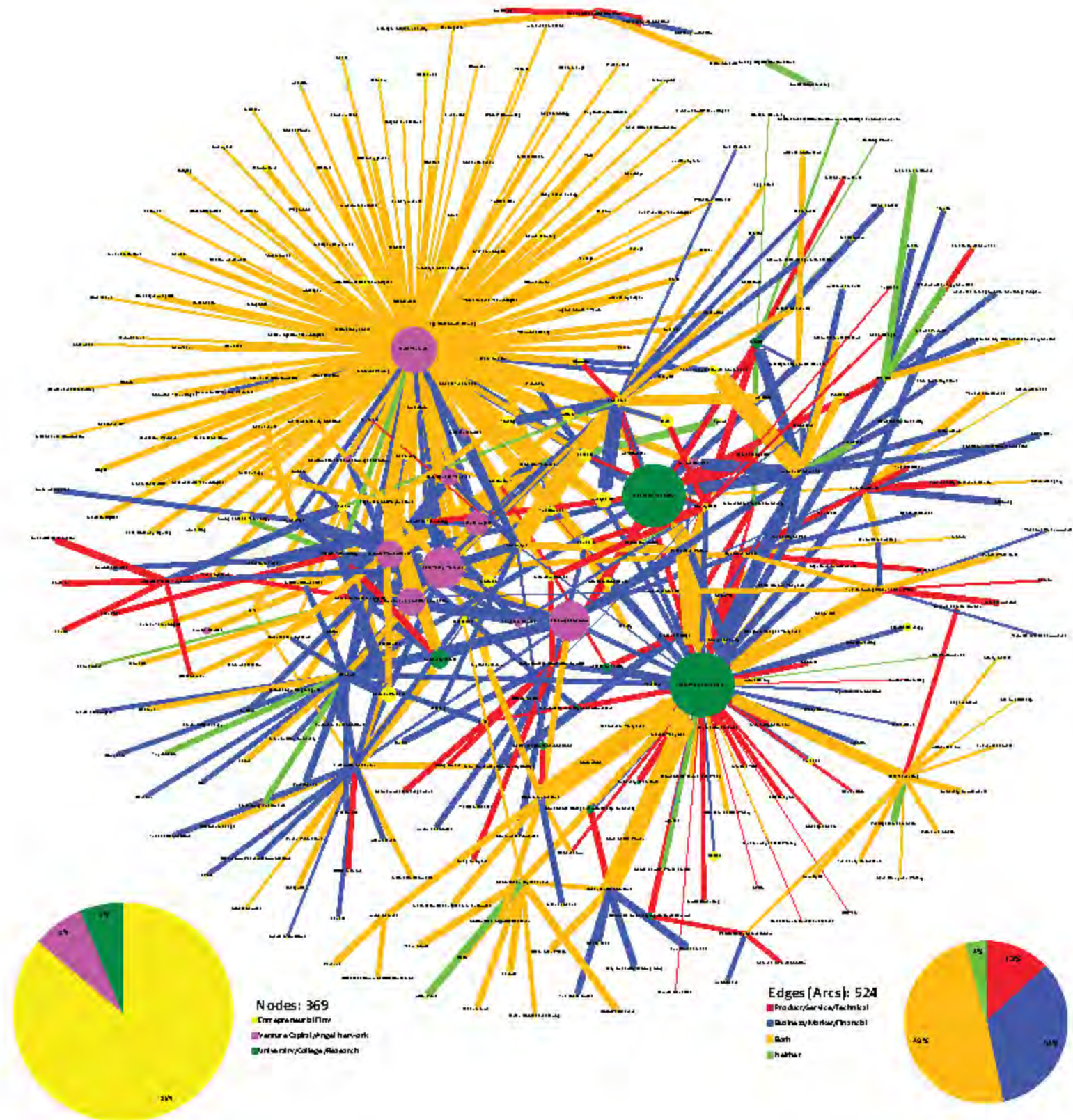
Knowledge-Seeking Activities of Universities, Venture Capital and Entrepreneurs

The stories of Silicon Valley and Route 128 were both dominated by the active participation of universities and personalities within those institutions (Saxenian 1994) and the contribution of available finance and venture capital were considered very valuable (Ferrary and Granovetter 2009). This analysis considers these three components of the system as a group.

The chart showing the interactions amongst the universities, venture capital firms and the entrepreneurs is composed of 369 firms, the vast majority of them being entrepreneurial firms is shown in Figure 2. There are 1.8 edges per node and the importance of the transactions is high, a weighted average degree of 11.6. This represents about half of the nodes and a third of the edges in the entire AEE. Again, the universities and the venture capital firms are driven to the centre of the chart highlighting their interconnectedness and thereby their importance to the structure of the ecosystem.

An examination of the entrepreneurial firms shows little interaction with other larger firms which has been an approach used in other ecosystems. The mixing and recycling of talent amongst large and smaller firms produces knowledge spinoffs that benefit both parties. Modest encouragement by larger companies in the Province can provide exceptional opportunities developing founders, and very early-stage ventures benefit from close proximity to, and mentorship by, successful high growth firms. Established innovating businesses can mentor aspiring technology oriented entrepreneurs to absorb business models, mentorship, technology, management practices, and the culture of fast-growing businesses.

Figure 2: Knowledge-Seeking Activities of Entrepreneurs, Universities and Venture Capitalists



There is little independent private venture capital in the AEE. Most of the firms are government-sponsored venture capital attempting to fill financing gaps. The larger ones are those which fulfill a government, or quasi-government mandate. For some of them, their mandate has expanded to provide a supportive and mentoring capacity in the ecosystem as well as incubating opportunities.

The universities are sources of both business and technical information for entrepreneurs and founders. This is demonstrated in the different colour arcs emanating from the universities. It is promising to see the role that the universities play in the previous iteration of the ecosystem, but in particular with this iteration, of the entrepreneurial firms. This chart's high average importance rating indicates its value. Clearly, the efforts that are being spent on entrepreneurship education inside the Universities are resulting in considerable involvement. The high levels of education of the AEE's constituents is no doubt related to this observation.

Implications & Opportunities for Future Research

This research calls attention to the multiple parties needed to stimulate entrepreneurial ecosystems (Van de Ven 1993), and addresses a more recent call for investigations into regional and contextual influences on entrepreneurial innovation (Autio, Kenney et al. 2014). This work expands the knowledge of entrepreneurship by focussing on the context of an entrepreneurial ecosystem's knowledge-seeking behaviours. It does so with an information-dense and revealing visual and quantitative examination of entrepreneurial ecosystems' knowledge-seeking behaviours.

Knowledge-seeking behaviours as a measure of innovation necessary for successful entrepreneurship and the use of network theory is a unique contribution to the entrepreneurial literature as well as the network theory literature. Together they endeavour to tease out specifics regarding the nature of the ecosystem's functioning.

Networking is an active way to create entrepreneurial opportunities for high-tech innovation, and high-tech founders exploit existing opportunities and deploy their networks to form new contacts and relationships that form new opportunities (Moensted 2010). Knowledge-seeking networks amongst an ecosystem expose founders to complementary competencies and resources to gain access to new knowledge and people.

The interconnectedness of the constituents in the AEE is amply highlighted in the charts. The AEE has an outward-facing orientation; many of the organizations implicated by the respondents were outside of the Atlantic Region although only one percent were globally based. More research is needed to examine whether the founders specifically had a global orientation, or whether it is other constituents who are reaching out to the world.

Entrepreneurs' overwhelming search for business, market and financial information rather than technical/scientific/product information is a surprising finding. A number of

reasons may explain it. If entrepreneurs are competent in their design, science and production of their products, their needs may be largely related to the development of markets, delivery of product, sales techniques and methods of building a firm. That would be reassuring. In an area of challenged resources and financial capabilities, the search for business acumen and finance may be expected. However, if the entrepreneurs are spending most of their time on business-building activities with little or no product innovations or design improvements, difficulties related to immature innovations may prevail.

Moreover, the metrics associated with the analyses specifically demonstrate the dwindling effectiveness of the AEE's knowledge-seeking behaviours when any one of the major 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. On average, the AEE is more knowledge-seeking when all the major constituents are in place. This is corroborated by extant research. It is recognized that governments cannot establish, or mandate, an entrepreneurial ecosystem (Soto-Rodríguez 2014). Only the value creation contributions of many actors working in concert through their interconnectedness (Cohen 2006) results in a functioning and sustainable ecosystem.

Further research opportunities abound using this method. Other research may answer questions about the mix of qualities that are necessary for successful ecosystems and provides opportunities for comparison. Is there more or less focus on university, or professional support, or venture capital funding, or incubators or accelerators in the winning regions compared to those less successful ones? Does success have more to do with the social order, or social capital? Is it influence, contacts, and networks that drive successful ecosystems, or is it capability of a number of key players that lubricate them? Is there a critical mass of venture capital required to grease an entrepreneurial ecosystem? Is there a critical mass of people working in a similar area that drives a cluster to become an innovation network? And if so, what is that critical mass? Future research may seek to investigate these areas.

Are there circumstances that cause dis-entrepreneurship. Dis-entrepreneurship occur if policies or actions cause ecosystems to fail to grow i.e. weak local investment, failure to take advantage of policy opportunities, or poor infrastructure (Honig and Black 2007). Much potential research is possible if similar analyses of other ecosystems' contexts are compared and contrasted.

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