

The MaRS DISCOVERY DISTRICT ENTREPRENEURIAL ECOSYSTEM PROJECT

Analysis by Ellen Farrell, PhD and Nathan Dennison, MBA MA

Company's Growth

It is a process to allow an organization to focus resources on the greatest opportunities to increase sales and achieve the company's target. Marketing strategy's goal is to increase sales and achieve the advantage over other competitors. It includes short term and long term objectives of marketing that has to do with the analysis of a company's situation and contribute to its objectives. The objectives will be based on how you gain sales by acquiring and keeping customers.



Opportunities to increase sales and achieve the company's target.

Categories	2013	2014	2015	2016
Computers & Devices	107,812	98,017	8,714	107,812
Electronics	108,928	116,283	47,029	89,918
Clothes & Fashion	39,912	152,912	278,161	123,939
Home Living	85,017	81,120	10,283	189,128
Kids Products	8,714	39,912	11,827	47,029
Medical	89,918	107,812	108,287	89,918
Others	89,918	107,812	108,287	89,918

Business Company

Curabitur suscipit, LTD
1234567890
1234567890
1234567890

Description	Quantity	Amount
248.53		
855.75		
394.12		

INVOICE

Date: 2016-01-01
Invoice No: 0000001
Customer ID: 223

Company's target.

Year	2015	2016
Product B - North America	8,714	39,912
Product A - Australia	107,812	108,287
Product A - Europe	89,918	91,938
Product A - Asia	123,939	125,819
Product A - Africa	189,128	278,161
Product A - South America	10,283	11,827
Product A - Oceania	47,029	107,812

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TABLE *of* CONTENTS

Mars District and the Atlantic Entrepreneurial Ecosystem Project	3
Genesis of the Research.....	4
Methodology & Network Theory	5
Impact Analysis.....	5
Reading the Charts.....	6
Nodes.....	6
Edges.....	6
Centrality.....	7
Survey Descriptives.....	7
Ecosystem Results	9
Entrepreneurial Ecosystem of Organizations.....	9
MaRS Discovery District Organizational Ego Network.....	14
Entrepreneurial Ecosystem of Individuals.....	18
Results of Ecosystem of Support Organizations	21
Support Organizations Impact on Fundraising & Capital.....	22
Support Organizations Impact on Markets, Revenues & Strategic Customers.....	24
Support Organizations Impact on Governance & Operations.....	26
Support Organizations Impact on Finding & Retaining Talent.....	28
Support Organizations Impact on Product Development Advice.....	30
Results of Respondents and Their Investors	32
Results of Respondents and Their Mentors	34
Results of Respondents and Their Inspirers	36
Discussion	40
Support Organizations.....	40
Mentors.....	40
Actions.....	42
Questions Raised by the Research.....	42
Suggested Readings	44

MaRS DISCOVERY DISTRICT ENTREPRENEURIAL ECOSYSTEM PROJECT

Relationships are important. They are important because innovation does not exist in the air, and entrepreneurial opportunities do not appear out of nowhere. Important for innovations and entrepreneurial consequences by foraging for innovative opportunities and forging entrepreneurial firm performance, knowledge is tracked and traded between economic actors in defined networks. Indeed, start-ups often begin with little more than the social networks of their founders, and entrepreneurs compensate for their lack of financial, market and information resources by drawing on their family, social and professional networks. These networks provide them with access to information and resources without having to engage, or pay for it. Using the capabilities of people they know, and make a point of knowing, entrepreneurs parse out the details of knowledge they acquire, the ideas it spawns, and get feedback and resources.

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

recognized as accelerants for economic development opportunities and regional advantage.

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

Another method to further economic transformations is the approach of encouraging entrepreneurial relationships one entrepreneur at a time. Building on a business leader-led approach, mentorship programs identify potential high-impact entrepreneurs who become the recipients of advisory experience and advice to help scale their businesses. Some of these high-impact entrepreneurs go on to become very successful and pay it forward by mentoring developing aspirers. The outcomes desired by mentorship-aspirer methods are buttressed by a well-developed ecosystem network. The effectively networked entrepreneurial ecosystem provides the petri dish for mentorship programs to cultivate potential high-impact founders and aspirers, as well as already-successful founders to act as mentors.

The network's high-impact nodes increase as pay-it-forward mentors and entrepreneurial success proceed. Well known organizations such as MIT's Venture Mentoring Service, and companies such as Endeavor promote the value of mentors in a variety of types of ecosystems.

This research report is the assessment of the entrepreneurial ecosystem of an optimum two-part environment described above. This report outlines the MaRS Discovery District's entrepreneurial ecosystem network and the network's capacity to provide the culture for nurturing entrepreneurs.

GENESIS of THE RESEARCH

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

The genesis of the relationship between MaRS and the Atlantic Entrepreneurial Ecosystem Project began at the international conference hosted by Ryerson, Tsinghui, and Oxford Universities during the summer of 2015 at Ryerson University. MaRS later participated in a large conference sponsored by Saint Mary's University featuring the work of Dr. Ellen Farrell and Nathan Dennison with participation from world-class scholars, policy organizations, significant entrepreneurial and educational bodies such as the Kauffmann Foundation, and industry leaders such as Gerry Pond.

The MaRS Discovery District's interest in augmenting their ongoing research efforts by pursuing similar network-based knowledge explorations began with some preliminary discussions in 2016. During those discussions, a large component of the scope of the work was assumed by MaRS Data Catalyst to contain costs. MaRS Discovery District's resources would be mobilized to reduce the labour associated with the delivery of a significantly large research project and concomitant costs. At the District's discretion, the data collection and survey preparation work was heavily weighted to their staff. The provision of these resources were a key element of the delivery of the work.

The MaRS District took responsibility for:

1. Advance and concurrent promotion and awareness generation of survey initiative
2. Creation and preparation of the survey sample
3. Customization of the survey instrument
4. Creation of a network theory database sufficient for expected number of variables and cases
5. Survey distribution, follow-up, and redistribution to potential respondents
6. Creating the database and entering data
7. Securing additional information about outbound entities (constituency, locale, type of organization, industry, stage of development)
8. Cleaning secured data (acronyms and names, misspellings, duplications, organizational subsidiaries and divisions)
9. Liason with Project Leader regarding preparation, execution, interpretation and delivery of results
10. Knowledge mobilization
11. Security of dataset and adherence to Protection of Privacy legislation
12. Liability associated with anti-spam legislation

Dr. Farrell provided her team's IP, advice, research, methodology, and oversight to the staff of the MaRS Data Catalyst Centre:

1. Support and use of survey methodology
2. Oversight of the survey customization, sample selection, distribution, and outbound activity development
3. Identification of appropriate variable operands
4. Execute analysis and results
5. Interpretation
6. Communicating results digitally
7. Report preparation

METHODOLOGY & NETWORK THEORY

Network analysis takes advantage of sophisticated software to examine the position and structure of a collection of relationships amongst a group of participants. The variables that are measured can be many (the antecedents), as are the consequences (the outcomes). Hence, it lends itself to many types of work. For many projects, the sophistication allows the measurement and empirical testing of hypotheses developed about a population. This section looks at the MaRS focused impact analysis and several constructs necessary to interpret and read network charts such as centrality, nodes, and edges.

This work is not a *who knows who*, or *who follows who*, or *who is linked to who*. This work does not use data from a LinkedIn account, nor a Facebook membership, nor a Twitter account where network data are downloaded with the permission of the participants and hundreds/thousands of data points are collected for a single participant. The MaRS Discovery District's network analysis uses data that is survey-based with carefully crafted questions and objectives. All the nodes and

8. Chart preparation and printing (where deemed necessary as subsequent deliverables)

During the survey creation phase, the focus of the research landed on elements that were more similar to the Endeavor survey (rather than knowledge-search based innovation discovery). This caused the responsibilities of the MaRS staff to increase as the data had to be formatted and re-coded to adapt to the network theory approach.

edges are based on information provided by the respondents to the MaRS Data Catalyst in a survey instrument distributed via the web.

The population was a compilation of the distribution lists of 17 supporting organizations affiliated with MaRS. The survey-based data is constructed around making decisions about specific types of questions and painstakingly encouraging and motivating respondents to reply to the survey. It has produced extremely rich data and results and extensive context.

IMPACT ANALYSIS

The purpose of this work is to investigate the use of support organizations and their connectivity with entrepreneurs. This objective focuses on the curious nature of individuals who take the initiative to search for information. The search - an action - is a behavior which

can be identified and measured. Shining a spotlight on these curiosity-calming actions and attempting to illustrate the resulting connectivity is the trademark of the Atlantic Entrepreneurial Ecosystem Project and the MaRS Discovery District's analysis. A latter objective was designed to look at the individuals' efforts with mentors and inspirers and investors.

READING *the* CHARTS

It takes considerable insight to interpret the charts. And not all charts present their results in the same manner. Because of this, it is important to understand the construct being measured in each chart (the measures are different for each chart that is subsequently shown here) and the nature of the resulting relationships. In some cases, the charts represent real relationships between the respondent and another individual (*Who was your mentor? Your investor?*) and sometimes they represent ideas or thoughts of the respondents (*Who was your inspiration?*). In other cases, they ask specifically about the respondents' sources of information with respect to important topics. The discussion about each chart will highlight different interpretations amongst the measures and the results.

Three concepts are most important to studying the charts: nodes, edges, and centrality.

Nodes

The nodes are the coloured circles, each of which represents a person or an organization, the entities of the dataset including the respondents and the people the respondents mentioned. One node represents one person or one organization depending on the chart in question. Alter is the term given to the persons or organizations (also nodes) that are mentioned by the respondent nodes. The colours of the nodes represent different values or rankings depending on the chart in question, such as the type of constituent, type of

supporter, or relationship between the node and the alter. Interpretations are discussed in each section.

Edges

The edges are the lines that connect the nodes to one another and represent the interpersonal relationships between the nodes (the inspirer, mentor, investor, support organization, etc.). The edges help us understand the level of connectivity between nodes: whether certain nodes are more involved than others; whether many nodes will cluster into larger groups; or whether some nodes will appear dominant. The edges also represent the direction of the ties between two nodes. Close (very close!) examination will show a pointed end and a blunt end to each edge. The blunt end is the respondent to the survey, and the pointed end is the person or organization they identified. The predominate flow of information is requested by respondents (founders) of their mentors, support organizations, or investors (alters). There are no edges emanating from alters.

Alters (those mentioned by respondents) were not subsequently surveyed with non-probability convenience sampling, a common feature of network theory, so the further reach of the network is not represented. A concern about the legal implications of surveying non-members prevented MaRS Data Catalyst from collecting this information¹.

¹ *New methodologies, such as response driven sampling, now allow for very accurate statistical inferences to be made with non-probability convenience sampling whereas, previously, biases associated with non-probability convenience sampling were considered to produce inferences that were highly subjective.*

Centrality

Centrality is the relative position of a node relative to the rest of the nodes in the chart. A node is driven towards the centre of the chart when a large number of edges are connected to that node. Such nodes seem important because the large number of edges involved makes them appear popular, or because removing it might considerably disconnect the network, or because the many edges define longer channels of influence.

In the hundreds of complex interactions, the more central a node, the more contribution it makes to entrepreneurial ecosystems' structures. Centrality in information flows generally predicts opportunities and advantages because centrality implies a larger collection of intellectual and human capital coalescing as those with expert abilities and knowledge are sought after for their talent and advice.

SURVEY DESCRIPTIVES

A total of 285 participants responded to the MaRS Discovery District survey. This is a large number of respondents given the population size (approximately 4000 though not all entrepreneurs). The MaRS survey results are a very successful effort by the MaRS Data Catalyst. Significant journals would find 285 respondents from a 4000-member population, at a 95 percent confidence level producing a margin of error of 5.59 percent², an acceptable hurdle. (Take for example, recent network theory studies published by Journal of Operations Management with 106 surveys from a target population of 1050, or 201 useable responses from a 7909 target population in the International Journal of Production Research)³. Moreover, usual response rate statistics are less constraining in network analysis as the inherent dependence amongst the nodes, the boundaries established of the survey group, and the number of edges exert more influence and confound normal confidence

level and margin of error interpretations.

Surveys are sensitive to absent data, but it is more of a burden for smaller populations where the missing data can produce relatively large deviant outcomes. (Health Leaders participating in Ontario's Child and Youth Mental Health program needed 36 of the 37 participants to respond for the peer reviewed Education Policy Analysis Archives)⁴. Almost 300 observations is not small and this work is less susceptible to the liability of smallness. Furthermore, large networks almost never survey the entire network when applying social network analysis because of the complexity. The temptation to have an analysis and picture of an entire network is overcome by efficient methods that study small sweeps of egos networks -- individuals' networks.

Electronic mail out surveys such as that used by the MaRS Data Catalyst have the benefits of low issues of sensitivity, low interviewer response effects, low data handling errors, and low administration costs. Electronic methods are also accompanied, however, by a low ability to establish rapport with respondents, and a low ability to elicit participation⁵. An affiliation component -- since the surveys were mostly distributed by local associations and support groups under the MaRS umbrella - helps mitigate those concerns.

² *The margin of error is the percentage identifying how much the behaviour described in the results is likely to deviate from the population in general.*

³ (Kim 2014); (Jin, Vonderembse, and Ragu-Nathan 2013);

⁴ (Rodway 2015)

Figure 1 - Respondents' Type outlines the make-up and distribution of the respondents to the survey. Based on the population sampled the distribution of respondents seems appropriate, mostly composed of entrepreneurial firms with a small sampling of professional, support groups, venture capital, and universities responding. For many of the professional organizations that come in contact with the survey (consultants, lawyers, accounting advisors, etc.), responding about client relationships is a breach of professional conduct which they rightfully decline.

Figure 1 - Respondents' Type

Respondents	#	%
Entrepreneurial Firm	240	88%
Support Organization	14	5%
Professional Services	14	5%
Venture Capital	2	1%
University	2	1%
NA*	2	1%

Figure 2 outlines that 75 percent of the respondents were men and 20 percent were women.

Figure 2 - Respondents' Gender

Respondents' Gender	#	%
Male	223	75%
Female	60	20%
Prefer Not to Report	2	1%
Not available	11	4%
Total	285	100%

The data set is complemented by the persons and organizations that the Respondents mentioned. Respondents were asked to identify others to whom they had reached out under the categories of Co-founders, Inspirers, Mentors, Investors or Support Organizations.

Figure 3 - Alters Reported by Respondents show that Respondents

mentioned 652 other persons or organizations (alters). This represents 2.3 alters per respondent. This average may seem low to the casual observer, however, the questions asked of Respondents directly mentioned alters who fell into the categories of Co-Founders, Inspirers, Mentors and Support Organizations. Thus, the Respondents were limited to specific types of alters they were invited to mention⁶ rather than being open ended.

Figure 3 - Survey Descriptives

Alters' Type Reported by Respondents	#	%
Mentor	270	41%
Co-founder	204	31%
Inspirer	97	15%
Investor	37	6%
Support Organization	38	6%
NA*	6	1%

(The percentages presented in Table 3 are based on figures which, if their absolute values were summed, would result in higher numbers than the total of unique nodes because of the prevalence of some nodes being cited multiple times, and sometimes in different categories. For example, MaRS Discovery District was cited 10 times in the survey results, eight of which were in the role of *Mentor*, one as *Inspirer*, and one as *Investor*. MaRS IAF was also referenced three times: two as an *Investor*, and once as a *Mentor*.)

⁵ Borgatti, Stephen P, Martin G Everett, and Jeffrey C Johnson. 2013. *Analyzing Social Networks*. London: Sage Publications Ltd. p 55.

⁶ Whereas other types of similar works may have had much larger "alters per respondent," those methodologies allowed respondents to identify their alters from any category of individual who impacted their business or search for information.

The report proceeds as follows, first looking at the whole ecosystem from the perspective of organizations and then individuals. The next section examines the detail in the requests for information by Respondents of Support

Organizations. The last three results sections highlight the Investors', the Mentors', and the Inspirers' relationships to the entrepreneurs. A discussion concludes the report.

ECOSYSTEM RESULTS

This section examines the total data provided from the perspective of the organizations in the ecosystem, the MaRS ego network, and the perspective of the individual persons in the ecosystem.

1. The first sub-section looks at the data from the viewpoint of the organizations noted by respondents and their alters.
2. The second sub-section of this analysis investigates the MaRS Discovery District's node and the organizations connected to it by any number of pathways.
3. The third sub-section examines the data by looking at the individuals named in the data. Because numerous people cited by the survey respondents serve as representatives of the same organizations, it changes the appearance of the data, nodes, and edges considerably.

The organizations mentioned more frequently are identified by larger nodes which are based on their in-degree. In this work, the edges between nodes have a direction from one node to another. In-degree measures the number of edges connected to a specific node which are directed towards that node from another. The larger nodes are clear in Figure 4.

A number of distinct constituencies emerge here as directed by the research objectives, principally entrepreneurs, mentors, inspirers, investors, universities and support agencies. There are 207 disconnected components (clusters or small communities of nodes). For each cluster, or component, the respondent is generally in the centre and their alters branch out around them. In social network analysis, the presence of many disconnected components indicates a lack of cohesion and a less dense chart. The components that are not connected with others are more isolated in their environments. This absence of edges spanning to other components reveals structural holes -- places where relationships do not exist and insulates ecosystem participants from one another. People and organizations that step into the structural holes improve the distribution of knowledge across their own network and communities of nodes, thereby benefiting themselves and those who are in contact with them.

ENTREPRENEURIAL ECOSYSTEM OF ORGANIZATIONS

The complete dataset of organizations has 637 nodes and 436 edges and is represented in Figure 4 - Ecosystem of Organizations. The small groups of nodes are clearly visible on the periphery, and a larger group of interconnected nodes coalesces towards the centre.

Figure 5 - Top 10 Organizational Ecosystem Nodes by In-Degree

Node	In-Degree	Eigenvector Centrality	Out-Degree
MaRS Discovery District	17	1	0
RIC Centre	7	0.309497	0
Communitech	4	0.239797	0
Virgin Group	4	0.070721	0
Innovation Guelph	4	0.070721	0
Tesla	3	0.114952	0
Environmental Business Consultants	3	0.114952	0
MaRS IAF	3	0.114952	0
OCE	3	0.114952	0
Innovation Factory (Canada)	3	0.053041	0

Another way of looking at some of the larger nodes more carefully is by inspecting their in-degree values in a table format. *Figure 5 - Top 10 Organizational Ecosystem Nodes by In-Degree* highlights the largest nodes by in-degree (the count of how many times the organization was mentioned by other organizations in the survey). None of the top ten nodes ranked by In-Degree had an out-degree greater than 0 because none of the representatives from these organizations completed the survey.

It is worth noting that eight out of the top ten organizations, ranked by in-degree, are support organizations. This suggests that the entrepreneurial firms in this ecosystem are more connected to these support organizations than to other common ecosystem participants, such as academic institutions, government agencies, law/accounting offices, and other entrepreneurial firms. The remaining two in the top ten were cited as inspirers (Richard Branson’s Virgin Group, and Elon Musk’s Tesla).

Eigenvector centrality is the relative importance of nodes in a network. Eigenvector centrality counts the centrality of a node and weights the centrality of the all attached nodes in an iterative manner. Thus, nodes

with high eigenvector centrality confers influence or popularity because they are nodes that are connected to other nodes that have high eigenvector centrality.

When ranked by their eigenvector centrality the list of top ten nodes changes quite significantly, with only MaRS Discovery District and RIC Centre being present on both lists⁷.

Figure 6 - Top 10 Organizational Ecosystem Nodes by Eigenvector Centrality. showcases the top ten nodes ranked by eigenvector centrality. Due to the level of influence the MaRS Discovery District exerts on the Organization Ecosystem, the nodes closely associated with it also received a high centrality result. As such, all ten of the nodes presented in Figure 1 are closely connected (1st or 2nd degree) to MaRS Discovery District.

⁷ Degree centrality measures just the number of adjacent nodes, but does not weigh the centrality of the adjacent nodes.





Figure 4 - Ecosystem of Organization
 MaRS survey results representing the entire entrepreneurial ecosystem. Only organizations were represented in this graph.

Nodes: 637 Edges: 436
 Average Degree: 0.684 Average Path Length: 1.152

Figure 6 - Top 10 Organizational Ecosystem Nodes by Eigenvector Centrality

Node	Eigenvector Centrality	In-Degree	Out-Degree
MaRS Discovery District	1	17	0
Ooka Island Inc.	0.548039	1	9
Dreambox Learning	0.548039	1	0
Knewton	0.548039	1	0
Danger Capital, Startup North	0.548039	1	0
Jennifer Cioffi Consulting	0.548039	1	0
Ibinary LLC	0.548039	1	0
Future Design School	0.548039	1	0
Sky Service	0.548039	1	0
RIC Centre	0.548039	7	0

Mentor relationships play a significant role in the search for information in the MaRS Discovery District ecosystem where a majority of ties between nodes relate to mentorship activities. Mentors develop relationships with their mentees and it is normal that mentees feel free to reach out to their mentors, and may do so before seeking advice from a professional or a support organization. Alternatively, they may turn to mentors to identify where the best information may be further sourced.

The Universities mentioned include University of Toronto, Ryerson, Queens, Guelph and Humber College. Their influence here is less prevalent than that in other locations where a large university presence is evident in the entrepreneurial ecosystem. Given the importance of universities in other entrepreneurial ecosystems of the world, this is surprising, especially considering the large number of well-recognized institutions in the MaRS Discovery District's geographic locale.

Three factors may explain the low levels of influence attributed to universities and colleges in this ecosystem. First, the survey instrument was not deliberately sent to universities as constituents of an ecosystem, but principally to entrepreneurs via support organizations. Perhaps the sample did not include significant

populations of centre directors, nor professors of university courses, nor university-run accelerators and incubators. Moreover, respondents who were affiliated with an incubator or accelerator may more readily identify with the named accelerator rather than the university sponsoring it. Lastly, because the survey's construction requested the respondents' university affiliations as part of the respondents' demographics, this may have mitigated their mentioning a university as a source, or a contact further along in the survey instrument.

MaRS DISCOVERY DISTRICT ORGANIZATIONAL EGO NETWORK

An ego network is a part of a network that is chosen for further examination and stems from a specific node as the focus, this node is the ego of the sub-network. This sub-section provides an analysis of the MaRS Discovery District as an ego network which includes all the nodes which are directly, or indirectly, connected to MaRS.

The MaRS ego network is by far the largest community in the data set with 26.8% of the ecosystem's nodes

(171 of the ecosystem's 637 organizational nodes) being connected to MaRS directly or via other paths that include many organizations. Information communicated by MaRS through its direct alters could circulate amongst all the nodes associated with MaRS. In practice MaRS's network is larger than mapped here because MaRS's ties, such as the RIC Centre and Communitech, for example, also have many alters that were not surveyed. Therefore, it is not possible to view an illustration of the Discovery District's true reach, as we are constrained by the data available from the survey.

A node such as the MaRS Discovery District is important because of the size of the number of pathways, nodes, and the large number of edges involved therein. MaRS is a hub and a pathway for many types of communication circulating amongst the nodes of the network.

Removing the MaRS node from the ecosystem would considerably detract from pathways of information amongst these 171 organizations. By way of illustration, the next largest community of pathways connects only 13 nodes.

Looking at it from another perspective, 73% of all nodes in the network are not connected with MaRS via any pathway.

A statistical comparison of the Organizational Ecosystem data (degree > 0) from Figure 1 and the MaRS Discovery District's Organizational Ego Network (Figure 7) is presented in the following two tables. The full Organizational Ecosystem represents the 536 organizations which possessed connections to other organizations⁸.

⁸ The figures and images of the Organizational Ecosystem show an additional 101 organizational nodes which were not connected to any other organizations. They are included in the network figures, but are not part of the statistics in the two tables.

Figure 7 - MaRS District's Community within the Entrepreneurial Ecosystem

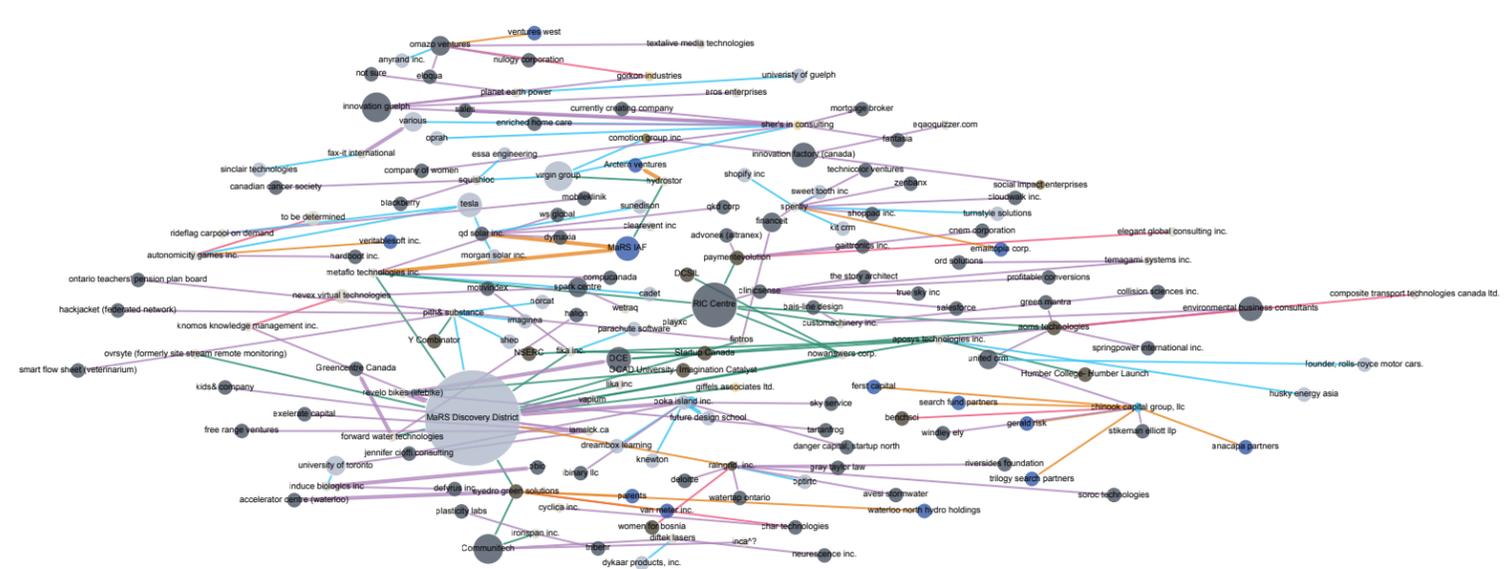


Figure 8 - Whole Network and Sub-set by Constituent outlines the percentage of the of the various constituent types found in the larger Organizational Ecosystem compared with MaRS's Ego Network sub-community. The two ecosystems are quite similar. This suggests a representativeness of the smaller to the larger ecosystem. In the larger ecosystem, 24.3 percent of the nodes are represented by Entrepreneurial Firms, whereas the MaRS Sub-community is somewhat lower (21.6%).

Figure 8 - Whole Network and Sub-set by Constituent

Constituent	Organizational Ecosystem N = 536 (%)	MaRS Ego Network N = 171 (%)
Entrepreneurial Firm	24.3	21.6
Mentor	38.6	43.3
Inspirer	16.8	17.0
Investor	5.4	7.6
Support Organization	1.7	1.2
Professional Services	1.9	1.8
Financial Institution	0.4	0.0
University	0.4	0.0
Venture Capital	0.2	0.6
NA*	10.4	7.0

The presence of Mentors in the MaRS sub-community (43.3%) outweighs those in the Organizational Ecosystem (38.6%). The larger proportion of Mentors in the MaRS subset may be recognized by their mentorship programs. Where relationships and mentorship are recognized as key learning and support opportunities, this should be interpreted as a competitive advantage for those connected in the MaRS network. Investors and Support Organizations are all quite similar from the larger Organizational numbers and the small MaRS ego network Sub-community. (Recall that Inspirers have no prerequisite to be known personally.)

Figure 9 - Whole Network and Sub-set Statistics

Measure	Organizational Ecosystem	MaRS Ego Network
Nodes	536	171
Edges	436	176
Average Degree	.813	1.03
Graph Density	0.002	0.006

MaRS's smaller proportion of Entrepreneurial Firms are much more connected (1.03) than the ecosystem at large (.813) as evidence by the average degree comparison in Figure 9. Average degree is a reflection of the average number of edges to connected to nodes in the network. The table reflects the greater connectedness of the MaRS sub-community compared to the larger Organizational Ecosystem. The MaRS Discovery District community expresses a higher average degree. Both the Organizational Ecosystem and the MaRS Ego Network possess low density which is not unusual in large network samples such as these. Density is an expression of the number of ties within the network as a proportion of the number that are possible; in a maximally dense graph -- equal to one -- every node would be connected to every other node. Larger ecosystems are expected to have lower densities. The MaRS Discovery District also has a higher density that the Organizational Ecosystem.

*Not Available originated from two sources: a) 19 nodes were assigned the type Not Available in the data supplied by MaRS, and b) 243 nodes contained Null (no value) values in the data. These Null values were thus not available for analysis and assigned the value Not Available.



ENTREPRENEURIAL ECOSYSTEM of INDIVIDUALS

The previous depictions of the ecosystem were represented by the organizational data submitted by respondents. In this section, the respondents and their alters are represented by their personal names, *Figure 10 - Entrepreneurial Ecosystem of Individuals*. For example, in this chart, MaRS is represented by a number of different individuals including: Aron Solomon, Jane Kearns, Krista Jones, Martin Summer-Smith, Salim Teja, Joel Liederman, and Rafi Hofstein. These various employees of MaRS are in the components of their clients who were the Respondents that mentioned their names. In the organizational chart, these persons were subsumed under one larger organization, MaRS. Hence, there are more nodes in the Individual Ecosystem charts than in the organizational charts.

Figure 10 - Ecosystem of Individuals

MaRS survey results representing the entire entrepreneurial ecosystem. Only individuals are represented in this graph.

Nodes: 865
 Edges: 619
 Average Degree: 0.717
 Average Path Length: 1.13

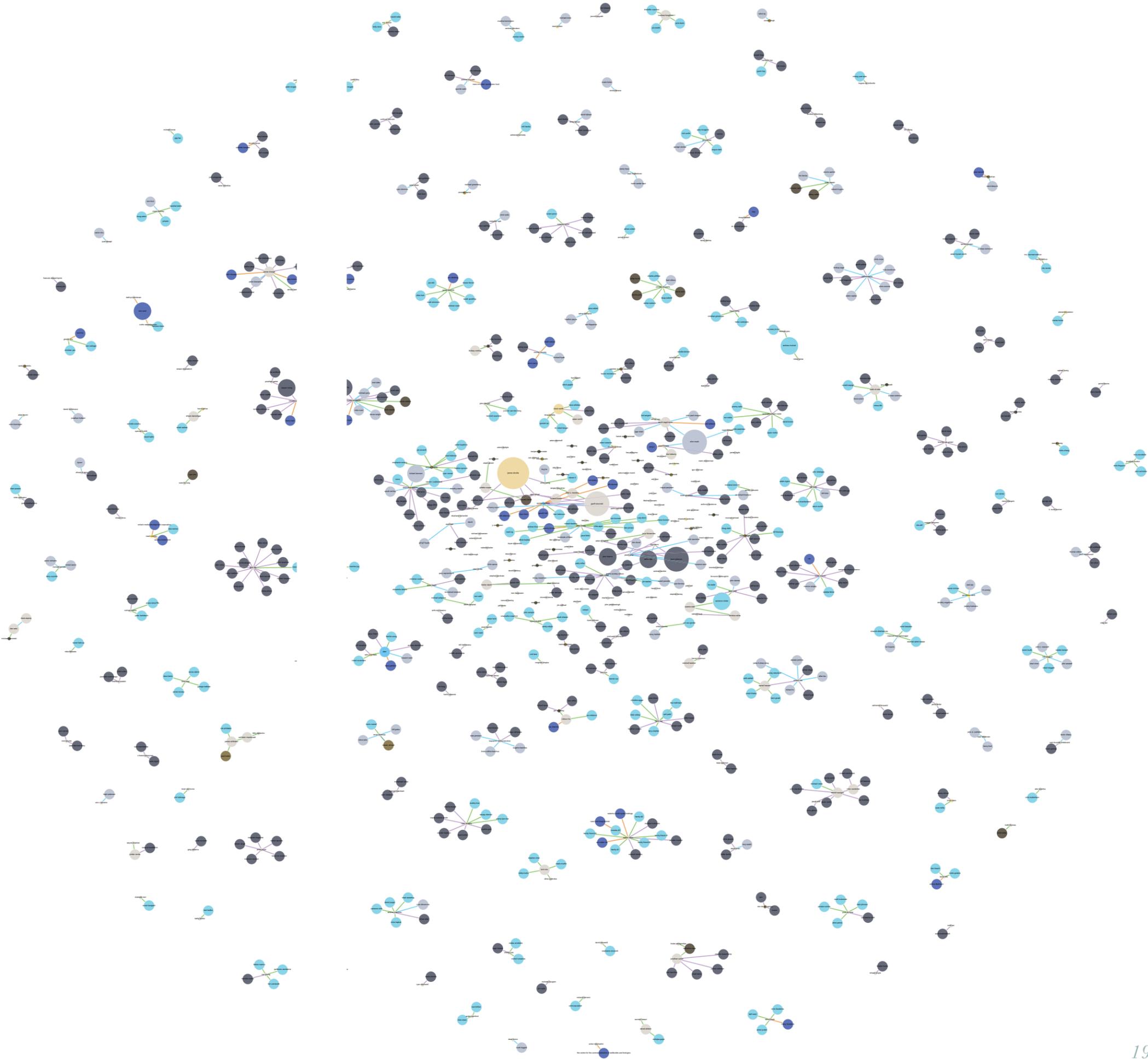


Figure 10 has a total of 865 nodes comprised of 298 respondents and 567 alters. The overall composition is largely dominated by mentors (29%), the respondents from entrepreneurial firms (28%), and individuals describing themselves as co-founders (21%). With the Organizational Ecosystem presented earlier, some survey respondents described their alters by their organizational names and not their individual names. Therefore, there are 79 nodes with a degree of 0 shown in this depiction. These nodes are not connected to any others; they are included in the graph, but are omitted from the statistical analysis.

Figure 11 - Node Size and Communities (Components) observes many components (clusters of nodes distinct from one another). The respondents are generally in the interior of these components - surrounded by their alters with whom they communicate. There are 168 components with

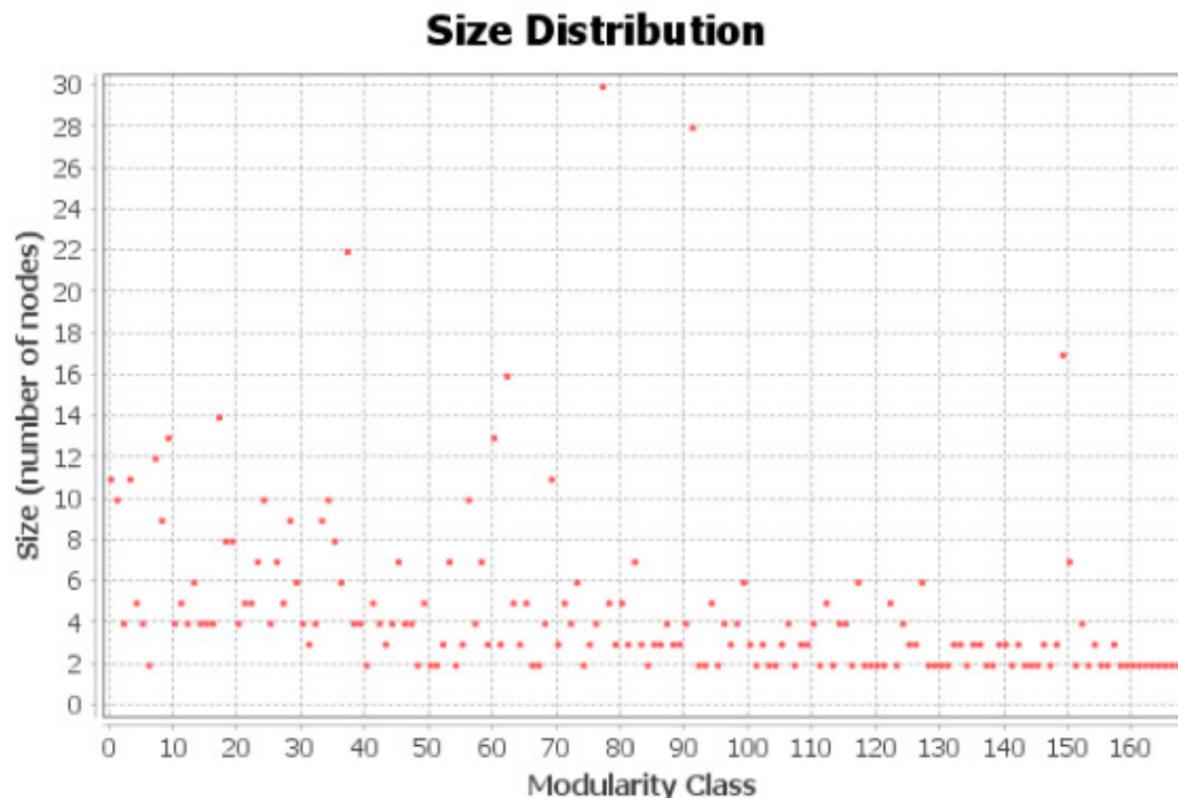
the largest containing pathways between 30 nodes. These highly disconnected communities depict very little overlap between Founders and their Support Organizations, Mentors, Inspirers, and Investors.

More bridging activity between Founders' social networks would be desired. Founders can gain vital information when they cultivate acquaintances from different circles of knowledge and influence.

Unlike the earlier description of the Organizational Ecosystem, the Individual Ecosystem has a greater distribution of components with larger circles of influence. Thirty-six of the components are comprised of six or more nodes. Figure 11 shows the distribution of the size of the components.

Figure 11 - Node Size and Communities (Components)

Modularity: 0.986
 Modularity with resolution: 0.986
 Number of Communities: 168



RESULTS *of* ECOSYSTEM *of* SUPPORT ORGANIZATIONS

Advice-seeking is the pursuit of information that can improve innovation and the execution of business activities thereby improving the long-term viability and profitability of a start-up. The act of reaching out and deliberately seeking information is an initiative that requires engagement. It is a behavior.

For many founders, their network is all they have to draw upon when they begin their firms. The reliance on their expanding network contributes to the cohesion recognized as vital to entrepreneurial success; entrepreneurs reaching out around the world for information that enhances their innovation and thus the creation of sustainable start-ups.

This knowledge-search is the basis of network analyses in other locations such as Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland and now Switzerland using the Atlantic Entrepreneurial Ecosystem Project's methodology. These works have shown universities, governments, venture capital, entrepreneurial and mature firms, professionals and support organizations as the key constituents of entrepreneurial ecosystems.

In the MaRS survey, the support organizations of the ecosystem were defined as accelerators, incubators, alumni networks, innovation centres, or government agencies that may provide business or product advice. The analysis includes the type of information that was sought and the impact that the support organization's advice had on the business decisions. Use of the term

impact as the quality to measure implies a strong effect which in its business use, is generally accepted to be a favourable measure.

The Respondents were asked to rate the Support Organizations by the impact of their advice in five different areas

1. Fundraising & Capital
2. Markets, Revenue & Strategic Customers
3. Governance & Operations
4. Finding & Retaining Talent, and
5. Product Development.

The best way to represent the information is to produce a different chart for each of the types of information sought from their various noted Support Organizations or agencies. The corresponding charts about each of the types of information sought appear in Figures 12 to 16.

In each of these charts, the nodes represent organizations that were volunteered by Respondents, and in some cases, individual names where no organization was known or provided. In these charts, the size of the node indicates the (combined) impact of the information that was sought by the Respondent. Bigger equals more impact. The size of the node is the sum of all of the impacts that were indicated by the combined respondents.

Each edge indicates three features. First, the edges indicate the direction of the sought information by the arrow's indication. The colour of the edge indicates

the type of Support Organization providing the advice. And third, the width of each of the edges reflects the frequency with which a member of the ecosystem sought information. The greater frequency with which a member of the ecosystem sought information is depicted in a wider edge. The legend used to identify the edge width is:

- Thin 1 = 1 time per annum
- 2 = 2 - 5 times per annum
- Wide 3 = 6 - 10 times per annum
- 4 = 11 - 20 times per annum
- Widest 5 = > 20 times per annum

SUPPORT ORGANIZATIONS IMPACT on FUNDRAISING & CAPITAL

Respondents indicate that information about Financial Support and Capital concerns is being sought from Support Organizations (52.82%), Mentors (38.64%) and formal and informal venture capital Investors (4.55%). This is encouraging -- entrepreneurs engaged in searching for information from other organizations in the ecosystem are taking advantage of supplied resources and mentorship to learn what they need to know for financing support raising capital. Learning from organizations mandated to support them signifies engagement that can help identify potential hurdles and methods to overcome them as shown in *Support Ecosystem Figure 12 - Fundraising and Capital*.

MaRS, OCE and RIC are the support agencies supplying the most combined impact relative to financing issues, and the combined impact of mentors' relative to financing issues reported by respondents is sizeable as well. The small impact of the VC reflects the relative

distribution of venture capital in a population. Only a very small number will be in the market for venture capital. Clearly, however, after successful encounters with MaRS, Combinator and Communitech, for example, information about venture capital might be sought by more respondents.

Support Ecosystem Figure 12 - Fund Raising and Capital

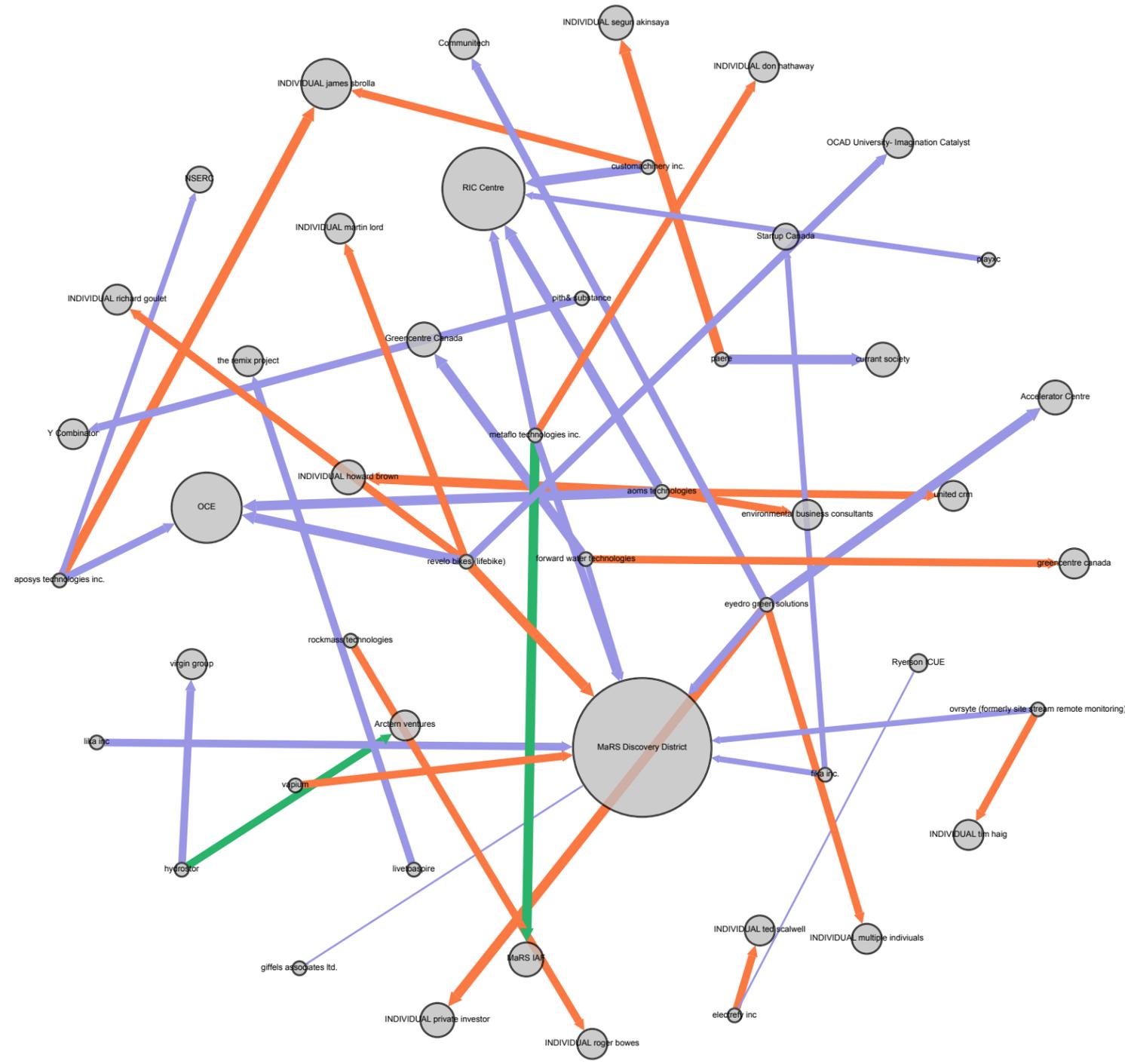
The size of the Edges indicates frequency (1-5)
This frequency scale was calculated as follows:

- Thin 1 = 1 time / year
- 2 = 2 - 5 times / year
- 3 = 6 - 10 times / year
- 4 = 11- 20 times / year
- Widest 5= >20 times / year

The size of the node indicates impact (sum of all in-degree weighted by Impact 1-5 scale).
The colour of the edges is related to the type of relationship between the two nodes.

Support = Blue
Mentor = Orange
Investor = Green

- Mentor (38.64%)
- Support Organization (56.82%)
- Investor (4.55%)



SUPPORT ORGANIZATIONS IMPACT *on* MARKETS, REVENUES & STRATEGIC CUSTOMERS

Respondents were asked about information sought regarding concerns about markets, revenues and identifying and building relationships with strategic customers. Information is being sought from Support Organizations (60.42%), Mentors (35.42%) and formal and informal venture capital Investors (4.17%) as shown in *Support Ecosystem Figure 13 - Markets, Revenues and Strategic Customers*.

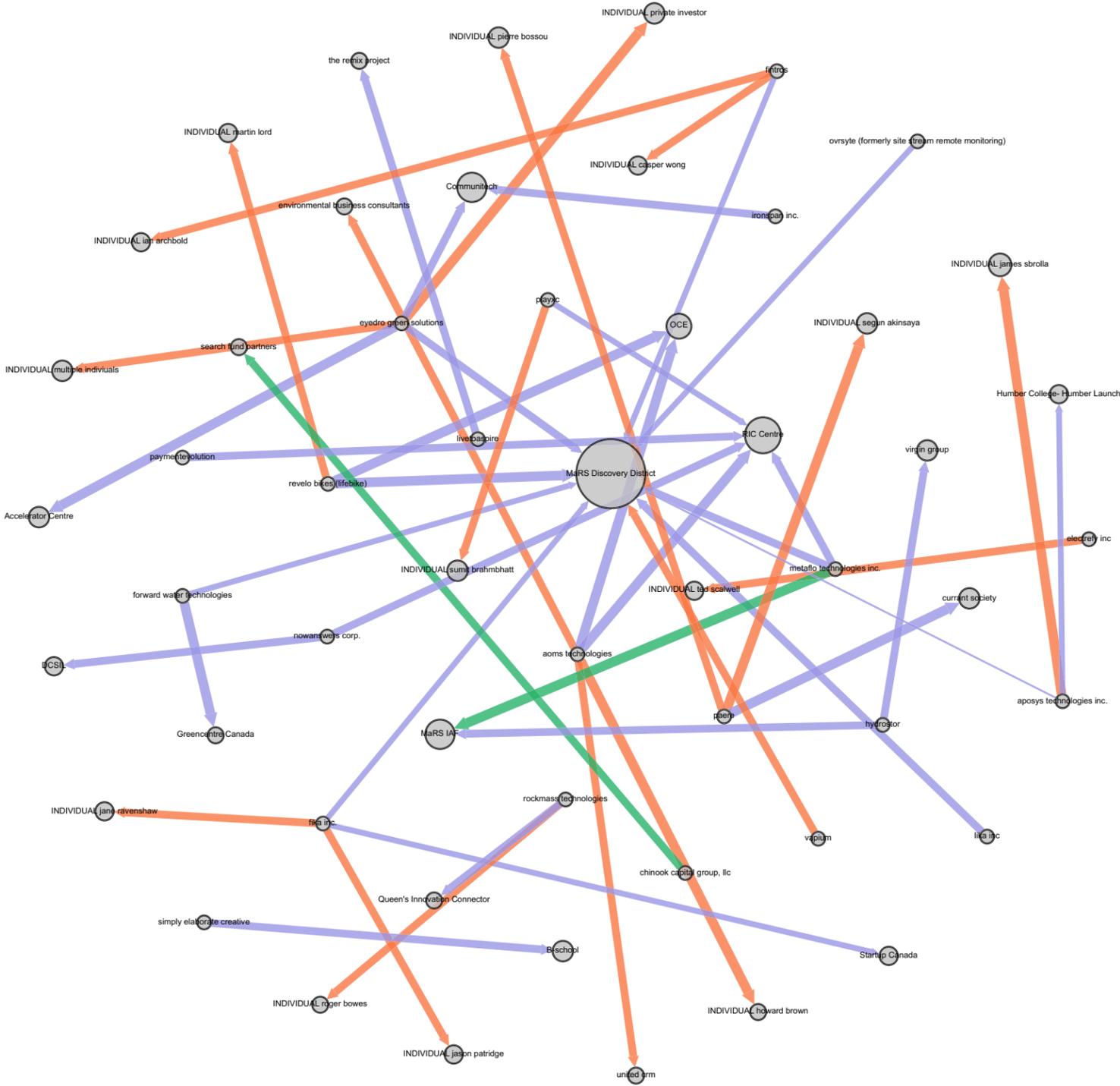
Support Organizations dominating the search of markets and revenues are by MaRS, RIC, Communitech, OCE, and universities Queen's and Humber College. Mentors are important in this category as most of them fielded numerous, 20 or more, discussions or requests for information from their mentees. Chinook Capital Group, LLC, Virgin Group and Search Fund Partners appear to be notable organizations for impact for the category Markets, Revenues and Strategic Customers.

Support Ecosystem Figure 13 - Markets, Revenues & Strategic Customers

The size (width) of the Edges indicates frequency (1-5)
 This frequency scale was calculated as follows:
 Thin 1 = 1 time / year
 2 = 2 - 5 times / year
 3 = 6 - 10 times / year
 4 = 11- 20 times / year
 Widest 5 = >20 times / year

The size of the node indicates impact (sum of all in-degree weighted by Impact 1-5 scale).
 The colour of the edges is related to the type of relationship between the two nodes.
 Support = Blue
 Mentor = Orange
 Investor = Green

- Support Organization (60.42%)
- Mentor (35.42%)
- Investor (4.17%)



SUPPORT ORGANIZATIONS IMPACT *on* GOVERNANCE & OPERATIONS

Asking Respondents about governance and operations support includes the impact of accounting legal, and board structure information. These results were most favourably demonstrated by RIC (size of the node). Communitech, MaRS IAF, OCE, and MaRS Discovery District all had favourable impact scores as well as shown in *Support Ecosystem Figure 14 - Governance and Operations*.

In terms of the frequency of interactions, mentor and individual, Tim Haig, fielded the most overtures for information and so did individuals and mentors Don Hathaway, Pierre Bossou, Segun Aknsaya and Sumit Bahmbhatt for the respondents in this section of the survey.

Support Ecosystem Figure 14 - Governance & Operations

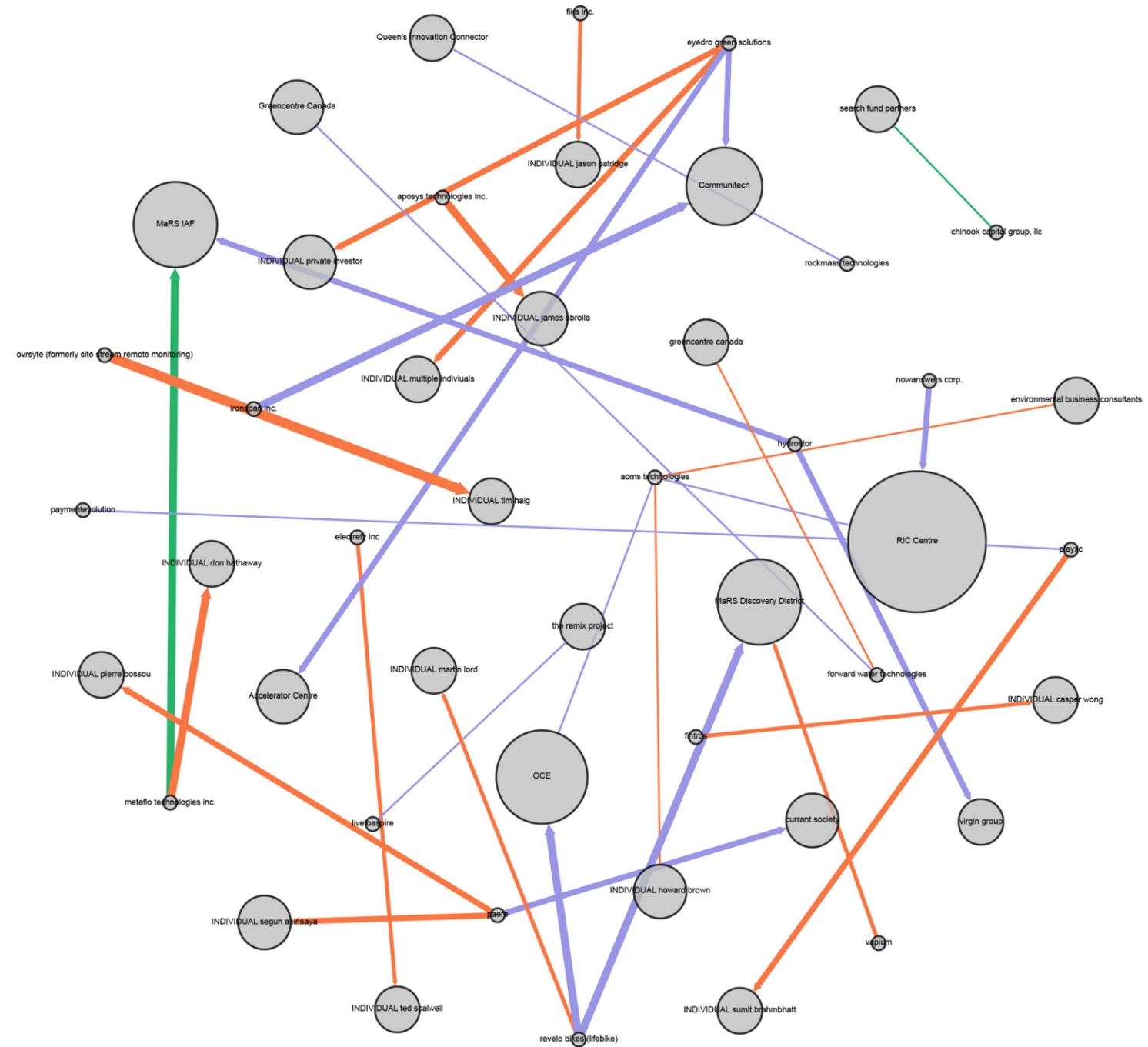
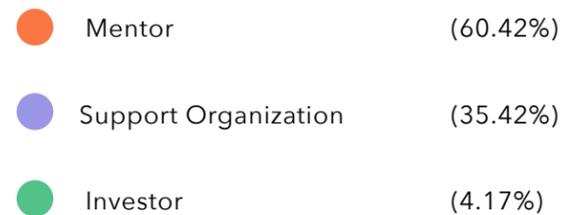
The size of the Edges indicates frequency (1-5)
This frequency scale was calculated as follows:

- Thin 1 = 1 time / year
- 2 = 2 - 5 times / year
- 3 = 6 - 10 times / year
- 4 = 11- 20 times / year
- Widest 5= >20 times / year

The size of the node indicates impact (sum of all in-degree weighted by Impact 1-5 scale).

The colour of the edges is related to the type of relationship between the two nodes.

- Support = Blue
- Mentor = Orange
- Investor = Green



SUPPORT ORGANIZATIONS IMPACT *on* FINDING & RETAINING TALENT

Finding and Retaining Talent such as building teams, defined as finding the best fit for the organization, was another sub-sub set of supports provided by Support Organizations and sought in the survey. Here RIC Centre provides the most impactful information. Communtech, MaRS Discovery District, and OCE provide significant impact as well illustrated in *Support Organization Figure 15 - Finding & Retaining Talent*.

Named support organizations and mentors take equal shares of the frequency of activity (@ 50%).

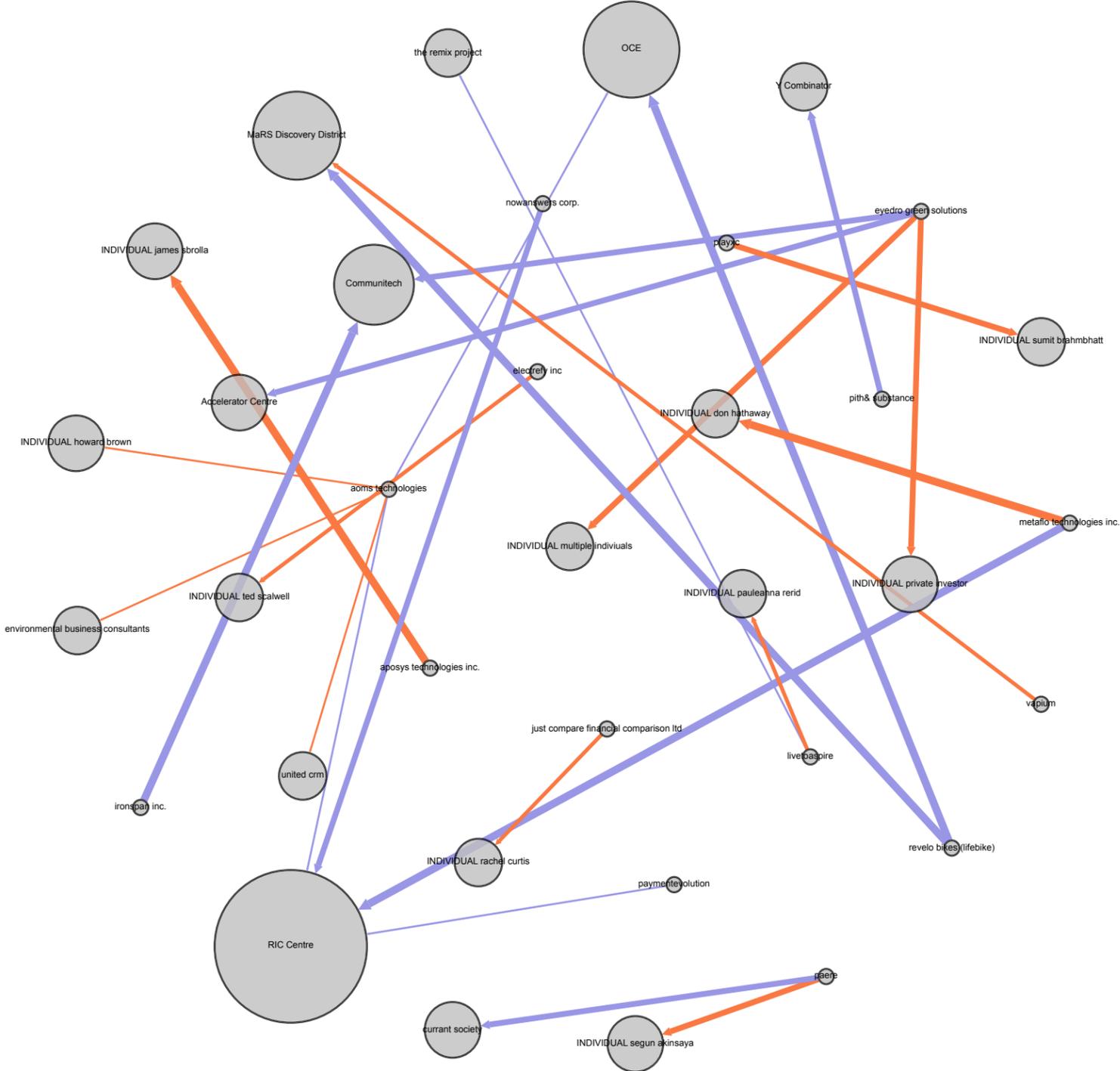
Support Ecosystem Figure 15 - Finding & Retaining Talent

The size of the Edges indicates frequency (1-5)
 This frequency scale was calculated as follows:
 Thin 1 = 1 time / year
 2 = 2 - 5 times / year
 3 = 6 - 10 times / year
 4 = 11 - 20 times / year
 Widest 5 = >20 times / year

The size of the node indicates impact (sum of all in-degree weighted by Impact 1-5 scale).

The colour of the edges is related to the type of relationship between the two nodes.
 Support = Blue,
 Mentor = Orange
 Investor = Green

- Mentor (50%)
- Support Organization (50%)



SUPPORT ORGANIZATIONS IMPACT *on* PRODUCT DEVELOPMENT ADVICE

The last chart in the Support Organization grouping is product development where product and intellectual property issues are addressed. Support agencies MaRS, OCE, Communtech, MaRS IAC, Accelerator Centre, Queens Innovation Connector, OCAD University-Imagination Catalyst, NSERC and GreenCentre Canada deliver the most impactful information. There are numerous individual mentor nodes in this category as well including Roge Bowes, Segun Akinsaya, Marin Loyd, Jane Ravenshaw, Don Hathaway. These lists are not exhaustive illustrated in *Support Organization Figure 16 - Product Development*.

In terms of frequency of interaction between the respondents and their information providers, the Support Organizations fielded 64.5 percent of the requests for information about product development, and Mentors advised 32.3 percent.

Support Ecosystem Figure 16 - Product Development

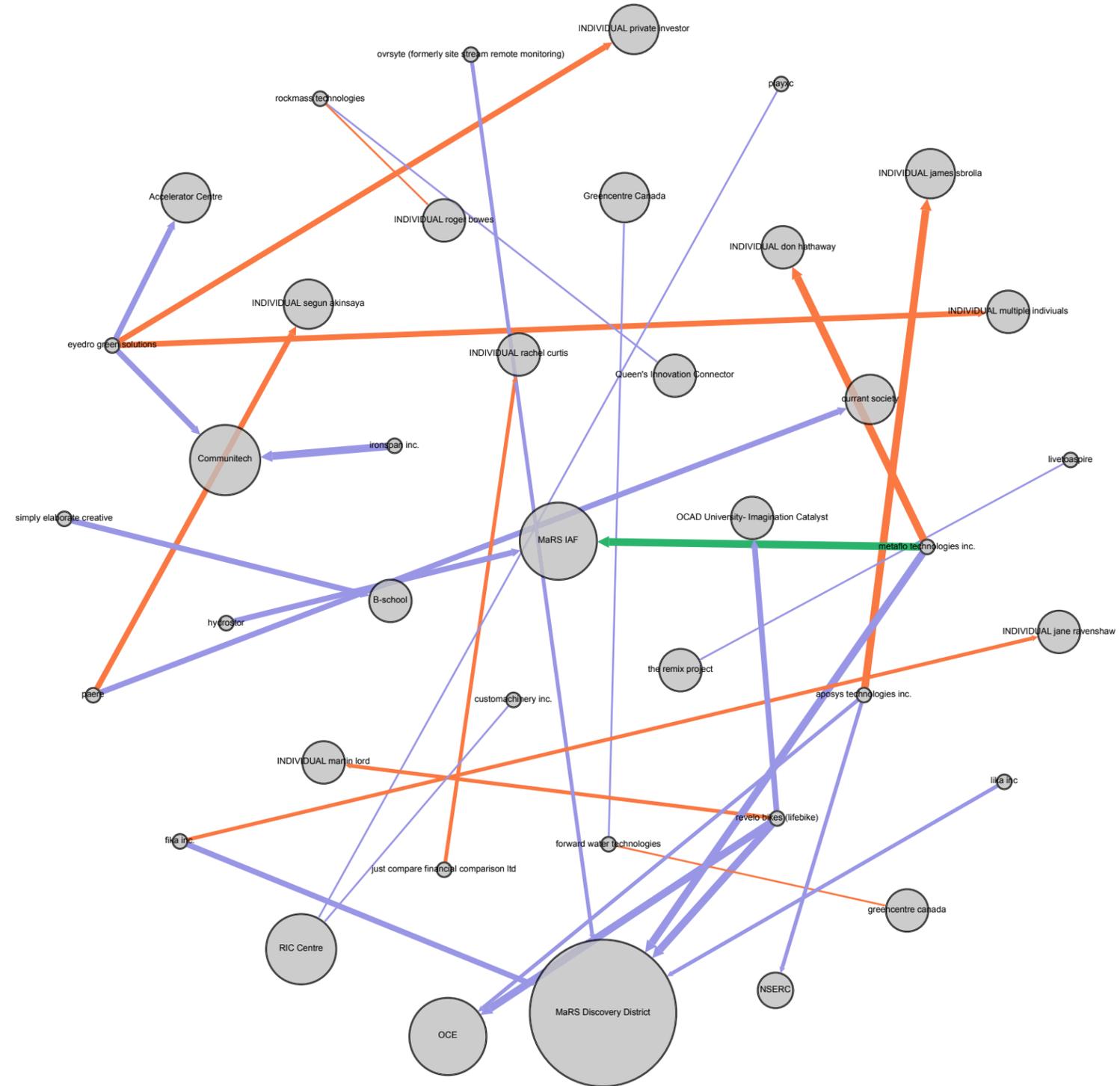
The size of the Edges indicates frequency (1-5)
This frequency scale was calculated as follows:

- Thin 1 = 1 time / year
- 2 = 2 - 5 times / year
- 3 = 6 - 10 times / year
- 4 = 11 - 20 times / year
- Widest 5 = >20 times / year

The size of the node indicates impact (sum of all in-degree weighted by Impact 1-5 scale).
The colour of the edges is related to the type of relationship between the two nodes.

- Support = Blue
- Mentor = Orange
- Investor = Green

- Mentor (64.52%)
- Support Organization (32.26%)
- Investor (3.23%)



RESULTS OF RESPONDENTS *and* THEIR INVESTORS

Respondents were asked about investments by a variety of types of Investors. *Figure 17 - Respondents' and their Investors* outlines the responses of participants to the inquiry about investors in their firms. There are 54 nodes connected by 32 edges in this graph. Entrepreneurial firms, presented as a light tan-coloured node, represent 35.2 percent of the participants in this chart, a total of 20 nodes. The Investors which in this graph represent all alters cited, comprise 55 percent of the total nodes, or 31 individuals.

This community of nodes represents nodes and alters who were connected to the respondents via an investment relationship; the Investors' names and nodes are the blue nodes¹⁰. Two respondents, identified themselves as VCs (teal), and cited investment relationships, as did one University (yellow), and one Support Organization (brown).

This figure represents only one type of relationship so there is no distinction between types of edges. As always, the arrow to the edge represents the direction of the relationship - from Respondent to alter. It is important to avoid confusing this with the direction of the investment.

Not surprisingly, the majority of the 22 components in this network are simple pairs of nodes, one survey Respondent and one Investor. The largest community (perhaps a syndication or a series of subsequent investments) contains six nodes. Following some of the

trails, two nodes with the most investor connections in the data were connected to five and three investors respectively. Some nodes, such as Steve Black, presented information labelled many investors that does not describe any detail of the individuals, the firms or syndication.

The largest community in *Figure 17 - Respondents' and their Investors*, is that of Quinton Griffiths and his investors. Griffiths represents the Venture Capital firm Chinook Capital Group Llc. This likely indicates the network of investors known to this fund, or those syndicating with Chinook Capital. Venture Capitalists like to syndicate their deals and need an abundant circle of trusting VC funds to do so. Syndicating has been described as a sobriety test to see if other VCs like the deal as much as the lead VC. By syndicating, VCs also signal their interest in being a syndication target for deals led by other VC funds - a kind of reciprocity -- to be invited to participate in deals identified by other VCs.

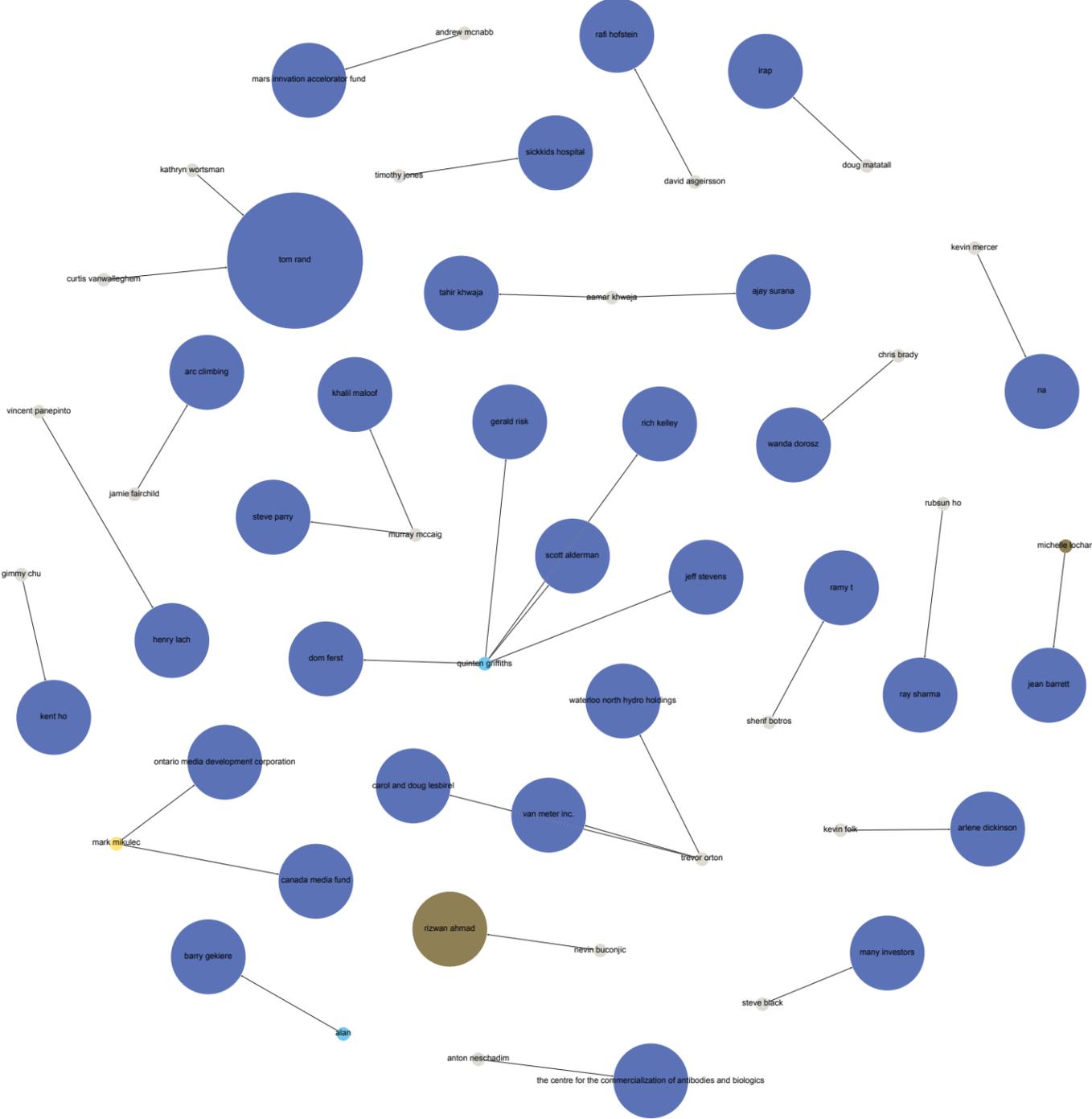
The one investor who was cited more than once in the data was Tom Rand. Rand was cited twice in the network, by Kathryn Wortsman and Curtis Vanwalleghem who both share the organization of Hydrostor.

A rate of approximately one percent of entrepreneurs in the ecosystem who cited an investment in their firm seems reasonably representative of the rates at which VCs make deals. Just short of one percent of the technology entrepreneurs targeted in the surveys have had an investment by at least one venture fund. VCs

report looking seriously at only a handful of deals out of hundred that pass their desks, and thus actually closing a deal with even fewer investments.

¹⁰ A thought-provoking element of the data collected by MaRS was for nodes to be categorized in multiple different ways. MaRS itself was cited as an Investor, Inspirer, but primarily as a Mentor.

Figure 17 - Respondents & their Investors
 Nodes: 56 Edges: 33
 Average Degree: 0.589
 Average Path Length: 1



RESULTS OF RESPONDENTS *and* THEIR MENTORS

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

The mentoring literature makes a distinction between peer-to-peer relationships and peer-to-mentor relationships. The age and expertise of the mentor determines whether the relationship is actually peer-to-mentor, and not simply peer-to-peer. Mentors are usually older and further along in their careers than the peer-to-peer relationships which have smaller age and stage-of-development discrepancies between the pair.

There is a tacit transfer of understanding about what it is like to work in an entrepreneurial firm that can be communicated by a mentor -- unwritten norms, attitudes, values, ways of behaving, and standards. Studies of non-entrepreneurs who are exposed to entrepreneurial mentors' social influences show an increased predilection to entrepreneurial careers particularly those offspring of non-entrepreneurial parents. To be clear,

these influences may mean careers in entrepreneurial firms, such as working in an early-stage entrepreneurial firm, not necessarily as a founder or co-founder.

The charts depicting Respondents and their Mentors, *Figure 18 - Respondents' and Their Investors*, follows. In this chart, the grey nodes are the mentors which are indicated by the pointed end of the arrow. The names of the corresponding entrepreneurs' nodes at the center of a component (cluster) are sometimes partially obscured by the arrows. The mentorship role was applied by the respondents to 61.1 percent of the alters mentioned. Professional Services (2.1%), Support Organizations (2.1%), and Venture Capital (0.48%) and Universities (0.24%) occupy smaller mentorship roles.

There are only a small number of network effects here. James Brolla is a mentor to four different individuals though he is thought to be part of a firm or Support Agency. Tim Peters is a mentor to three people and indicates his own mentors as well. Aron Solomon, Salim Teja and Jane Kearns are acknowledged as mentors by more than one person.

For the most part, although Entrepreneurial Firms are identifying Mentors, it would be expected that many of these relationships are informal relationships since some Respondents indicate as many as eight Mentors and it would be improbable to keep up close ongoing relations with so many mentors.

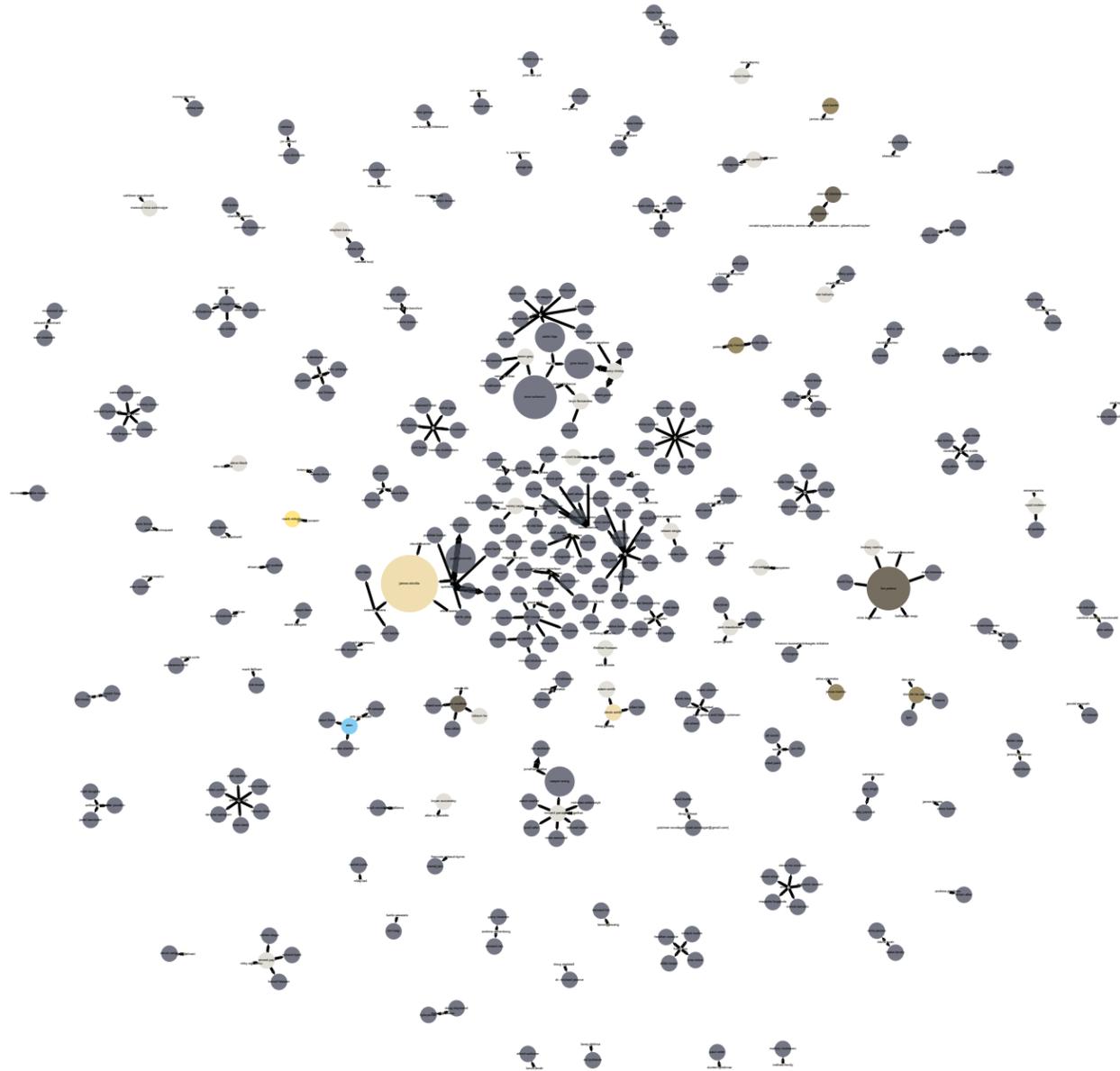
VCs report looking seriously at only a handful of deals out of hundred that pass their desks, and thus actually

closing a deal with even fewer investments.

The mentors are overwhelmingly male. By visual inspection there are about 13 women noted as Mentors; many of them are acknowledged by women Respondents. It would seem important, if most women entrepreneurs were motivated by a woman mentor, that a concerted search of excelling female entrepreneurs be undertaken to develop women mentors.

In some instances, individuals who are reporting mentors in the data are also being recognized as Mentors to other by other Respondents. Examples of this phenomena show entrepreneurial firms reaching out to other entrepreneurial firms as mentors which are valuable occurrences. It is not known, however, what proportion are peer-to-peer or peer-to-mentor.

Figure 18 - Respondents & their Mentors
 Nodes: 421 Edges: 302
 Average Degree: 0.717
 Average Path Length: 1.162



RESULTS OF RESPONDENTS *and* THEIR INSPIRERS

Entrepreneurial inspiration is commonly defined as the ability to change hearts and minds towards entrepreneurship. It is a construct with an emotional element and there is evidence that points to a positive link between entrepreneurial inspiration and start-up intentions. Inspirers act as role models for aspiring, or struggling, entrepreneurs. Individuals acting as inspiration provide an intrinsic motivation that spurs founders and co-founders to higher ambitions. Surprisingly, there is little formal research into the impact that inspirational people have on entrepreneurial performance, behavior, or motivations.

When sources of inspiration are local, it is anecdotally thought to have a greater impact on entrepreneurs because the presence of local inspiration generates greater networking opportunities, nurturing activities, and potential for mentorship. The physical proximity enhances the number of occasions a founder might meet an inspirer.

An effectively operating, well-oiled entrepreneurial ecosystem with highly developed networks and opportunities to meet socially, can precipitate meetings between entrepreneurs and their potential inspirers and spread the folklore of the local heroine's entrepreneurial

story. This has a cumulative self-perpetuating effect on future levels of entrepreneurship¹¹.

The MaRS Discovery District survey treated the constructs (inspirers and mentors) separately although research in the area discusses the inspirational benefits of local mentorship and discusses both constructs as being closely linked. Key to the distinction between the two is the deep interaction required of a mentor which is not a requirement for an inspiration.

The Inspirer quality investigated in the MaRS survey does not require the Respondents' to have personally met, or communicated with, their Inspirers. This quality is part of the construct referred to as theoretical inspiration which is represented by external sources such as classmates, peers, teachers, digital or mass-media personalities, cases, business networks, family or colleagues, and/or very famous icons in a particular field (i.e. Roberta Bondar for space travel, Elon Musk for technology, Mahatma Gandhi for civil rights disobedience, etc.).

Practical inspiration, by way of contrast, is induced by hands-on exercises and activities that serve to heighten confidence and interest in the topic (executing business or technical exercises, cases, simulations, etc.). Unlike

theoretical inspiration, practical inspiration interventions can act as de-inspiration as well, as participants come to recognize the hurdles and challenges that must be overcome.

The chart outlining inspirers is located in *Figure 19 - Respondents' and Their Inspirers*. It is more likely that persons or individuals are inspirations rather than organizations, so this chart shows the individuals (personal names) involved, not their organizational names. Inspirers were defined by the survey as persons who inspired you to start your business and become an entrepreneur. The questionnaire goes on to instruct respondents that knowing the individual personally was not necessary to note an Inspirer. Survey Respondents had the option to mention several inspirations.

In the results, the respondents to this question, named many alters who would be little known to the average reader of this report, or interpreter of this survey. Investors/ entrepreneurs known in their community such as Tim Peters, Kevin O'Leary, or entrepreneurs in residence James Sbrolla (veteran of the financial and environmental industries) and Jeff Simonett; and tweeter-extraordinaire Aron Solomon seemed to be identified as local in Ontario (captured via LinkedIn searches). Others, however, were well known although not necessarily local, nor alive, such as historical luminaries Thomas Edison, Henry Ford, or Sir Henry Royce. Some inspirers are famous individuals known in their disciplines, and in a current time frame such as Sir Richard Branson, Oprah Winfrey, and Elon Musk.

The person responding to the survey is at the blunt end of the arrows in this chart. The arrows on the edges indicate the direction of the inspiration. The small node

or the source of the arrow is the respondent, and the inspiration is the source of the arrows direction. Thus, the direction of the arrows (the pointed end) indicates the person who is the inspiration. In this chart, those inspirers are grey if they did not have any other role (40.63%). Those other noted who had other roles in the ecosystem are noted by their roles' colours.

The number of times an individual is mentioned as an inspiration enlarges the size of the inspirer's node. For example, Elon Musk, Tim Peters, Aron Solomoon, and James Sbrolla were mentioned by three or more respondents and appear as larger nodes. The edges for this chart are not value-laden -- meaning there is no strength, nor frequency, nor even personal knowledge implied of the relationships indicated by the edges. Rather, the relationships simply indicate the presence or absence of an inspirational individual by the respondent.

In some charts, the centrality of a constituent is an important function of their connectivity. In this chart, however, no one was required to personally know their Inspirers so their centrality does not imply any meaningful quality. For example, Elon Musk appears at the centre of the chart and appears to be slightly more connected to people who are also connected in the network. In the ecosystem, Elon Musk is not more "connected" because those who referred him had not necessarily met him. It is hard to know in this specific case since it is possible that some entrepreneurs have met him.

This chart is composed of many components. Components are groups of nodes that are not connected to other groups of nodes. They are island, individual clusters, or tiny communities. There are many small components of two, three and four nodes that have no ties to the rest of the network. These circumstances would normally indicate a lack of cohesion, however, because the inspirers are not necessarily in the area, nor known by the Respondents, the lack of cohesion is irrelevant.

One important feature given the framework outlined at the beginning of this section would be to know the general geographic location of each of the respondents as well as the Inspirers indicated in this chart. Accumulating more local inspirers can be a quality that the ecosystem may want to aspire to, much like the mentors noted earlier. It is also unknown, whether there are any identifiable relationships that might exist between the Respondent and their Inspirer -- such as a parent, or a neighbor, or a professor, or an investor, etc.

Like the Mentors in the previous section, the Inspirers are overwhelmingly male. The community at large may want to acknowledge, publicize and create public opportunities for successful female entrepreneurs and operators to become widely known inspirers for women.

¹¹ Brown, R. and C. Mason (2017). "Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems." *Small Business Economics* 49(1): 11-30.

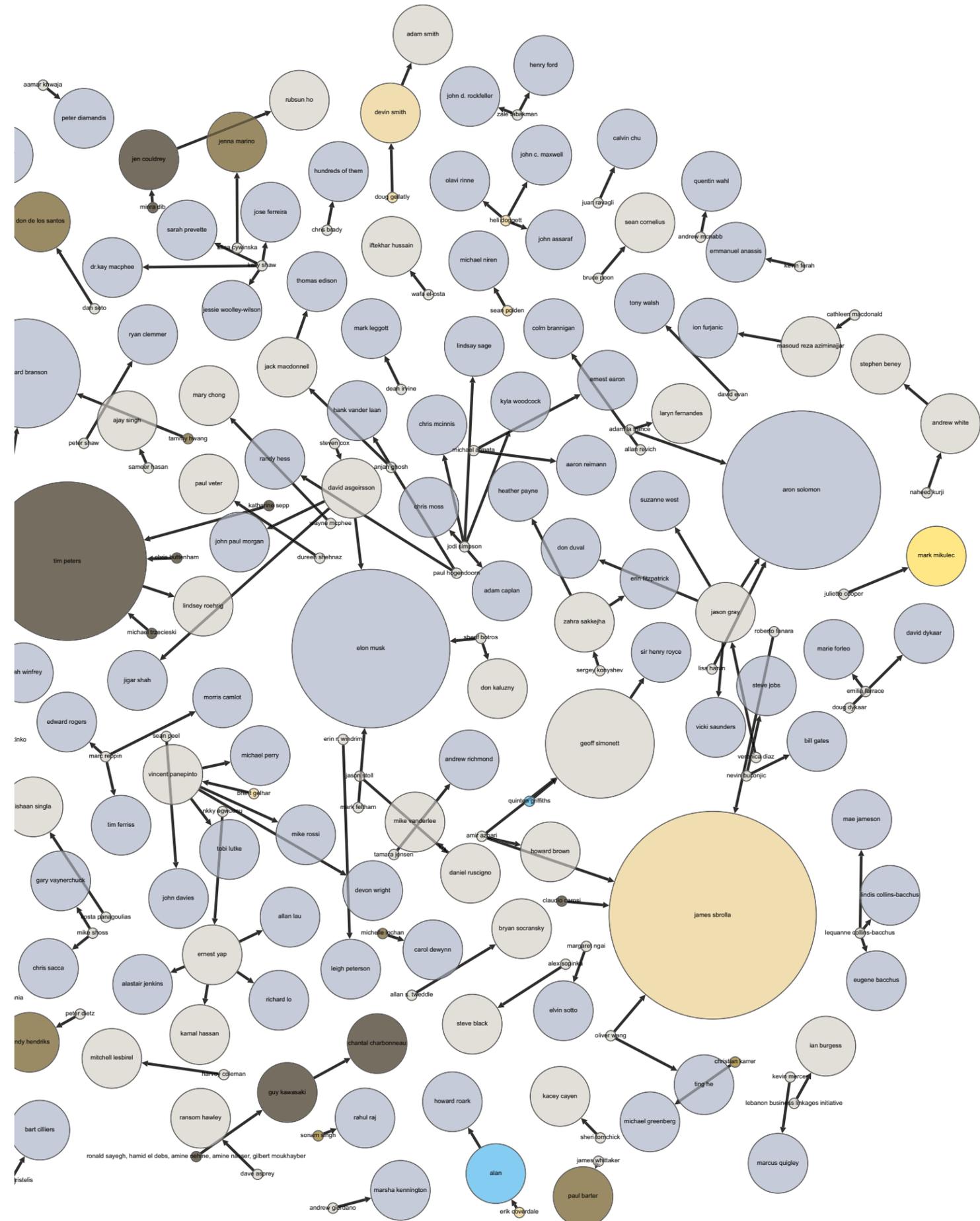
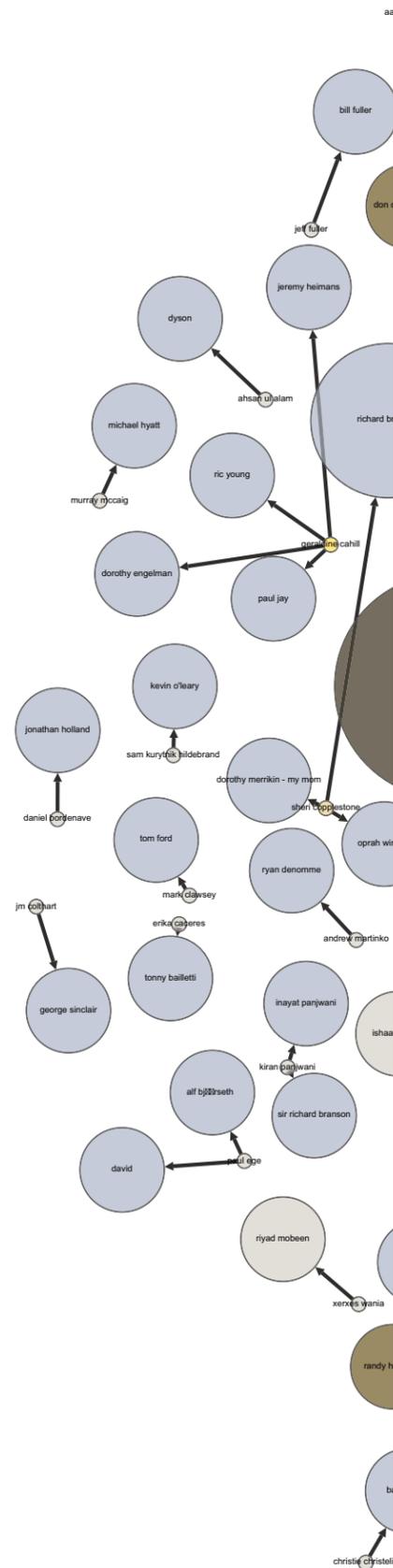


Figure 19 - Respondents & Their Inspirers
 Nodes: 224
 Edges: 146
 Average Degree: 0.652
 Average Path Length: 1.17

DISCUSSION

Entrepreneurs with strong networks capitalize on confidence, experience, and their relations with others, thereby facilitating access to information and knowledge. Improving the cohesion of entrepreneurial ecosystems has myriad benefits; most notably, entrepreneurs' networks are a positive indicator of entrepreneurial firm performance.

Entrepreneurs with greater networks and social capital are more capable of influencing the financial performance of their firms through improved sales and the acquisition of finance – two key areas of difficulty for growing firms. Entrepreneurs who use their networks access resources and facilitate their ability to acquire finance by taking advantage of strong ties. Strong ties, who are more likely to be closer acquaintances and friends, are also linked to sales performance.

Connectivity is crucial in an entrepreneurial ecosystem. The more cohesion there is amongst components (different social circles) the more different kinds of knowledge can be shared. The actors straddling different components are able to combine different spheres of knowledge that produce innovations.

The presence of many components (small clusters not attached to other clusters) indicates an absence of cohesion amongst the nodes in the ecosystem and is worth careful consideration. The absence of multiple cross-connectivities suggests that some components are very isolated. The knowledge circulating in other components is not reaching them, nor does the knowledge they are circulating escape their circle. The organization or individual who can create bridges between these components stands to benefit from informational advantages and cross-pollinating more information through the ecosystem.

SUPPORT ORGANIZATIONS

The activities of Support Organizations were scrutinized in detail. Some specific observations are made in reviewing these charts. MaRS has the most clout to be a catalyst business leader to cultivate relationships because of their footprint in the ecosystem. Its access to the ecosystem occupies a large presence and its affiliations help pinpoint high-impact entrepreneurs to act as mentors and inspirers.

Agencies should be able to maximize their resources because various organizations and agencies have different specializations. The type of information sought from organizations and agencies should be distributed by the stage of the respondent's company and the specifics of the entrepreneurs' requests. Overall, the same support organizations were continuously mentioned including RIC Centre, MarRS Discovery District, MaRS IAF, OCE, Communitech. To a lesser degree, the Accelerator Centre, Queen's Innovation Connector, and Virgin Group are variously mentioned. The largest combined impact for all observations was observed at MaRS Discovery District, RIC Centre and OCE.

MENTORS

Learning from one another (peer-to-peer) has reciprocating benefits. Peer-to-peer learning brings fresh insights as long as peers recognize that knowledge shared should be treated with some skepticism. Working together to create empathy and mutual benefits

enhances learning and development of entrepreneurial capacities. Existing entrepreneurs have knowledge and experiences to share with newer entrepreneurs and help build confidence while less experienced entrepreneurs bring new perceptions, innovations and fresh insights to existing entrepreneurs. Reaching out to other entrepreneurs can take the form of cooperating, co-learning, consultative and collective actions.

In addition to enhancing entrepreneurial desire, the tacit skills learned from working or consulting with peers or mentors inform emerging entrepreneurs on the difficulties and ambiguity associated with entrepreneurship. Discouragement of entrepreneurship is a benefit if these engagements discourage weaker actors.

In the results of the ecosystems around Support Organizations, Mentors also played a significant role in supporting entrepreneurs. Mentors were equal to or just behind the role played by Support Organizations in every instance identified in the results. There is considerable merit to this where a bona fide mentor is concerned, i.e. someone with better experience and advanced understanding of the topic concerned. However, it is not clear whether the mentors are formal, established relationships developed between more mature organizations and mentees. Or are they informal relationships whereby an entrepreneur calls on someone with whom they are acquainted to ask for advice?

The principle concern here would be if entrepreneurs are reaching out informally to people they can confide in, but who are not the best versed in the topic in which the entrepreneur is interested, if entrepreneurs are identifying their own mentors based on qualities that might be less than those espoused by established Support Organizations. An informal mentor may have only anecdotal knowledge based on his/her own experience. While it is beneficial to see entrepreneurs reaching out to one another, it could be a harbinger if entrepreneurs are reluctant to turn to the agencies and organizations who are mandated to support them

with knowledge based on broad backgrounds and qualifications.

Alternatively, mentors may have significant experience in specific areas where agency personnel have not been personally previously engaged. Agencies and policy interventions may want to consider these observations. Regardless, the source of the mentors expertise is worth considering.

Inspirers and mentors are overwhelmingly male. Furthermore, where women were noted, it appeared that they had female inspirers and mentors. The diversity of the ecosystem will improve if there is a focus placed on women mentors and inspirers. The ecosystem community needs to acknowledge, publicize and create public opportunities for successful female entrepreneurs and operators to act as inspiration for young women.

ACTIONS

Actions that may enhance the cohesiveness (knittedness) of the ecosystem to make it denser and more interconnected include:

- Continue to cultivate mentorship opportunities for entrepreneurs (Endeavour, MaRS, and others);
- Invoke the lore of the local success stories for inspiration;
- Provide marketing mechanisms for peer-to-peer events to improve connectivity;
- Encourage the lone wolves to attend meetings to become acquainted and engaged, thus learning from one another;
- Develop more cohesiveness-cultivating events (perhaps neighborhood based) for entrepreneurs to meet, to network, to cultivate confidence, and to address issues and difficulties;
- Craft tacit learning and entrepreneurial educational experiences for new comers to specific events to either cultivate effective actors or weed out weaker ones;

Make concerted efforts to ferret out women founders to motivate women and to act as mentors and inspirers.

- Appraise the ecosystem, wherever possible, about the fundamental imperative of boundary spanning in order to embolden entrepreneurs to reach out to other communities and networks;
- Reach out to the respondents in this study and organize an event for them specifically.

QUESTIONS RAISED *by* the RESEARCH

Because of the importance of mature firms to entrepreneurial ecosystems, it is worthwhile to assess the age of the firms represented by the individuals from whom respondents sought support. Recognized as instrumental to the growth and sustenance of innovation and entrepreneurship, mature firms are vital in an ecosystem. The histories of the great ecosystems of the world are punctuated by large, or mature, firms that engaged in knowingly, or unknowingly, supporting the ecosystem in ways other than simply becoming a customer. Finding the mature firms identified in the ecosystem will escalate interactions between young firms and mature firms. It is hard to identify the outreach to other mature firms with this data. It may not be difficult or costly to identify the relative stage of development of the small number of firms that were identified by respondents as being sought-after for information and knowledge.

Knowledge of the geographic location of each of the individuals named in this chart helps to identify local star-quality entrepreneurs on whom to focus. More local champions improve the opportunity for aspiring start-ups to meet or have access to role models and heroes. Answering questions such as a geographic locale are often possible with little effort -- following the original data collection -- by applying some person-hours to identify the various locations of the respondent, inspirers, mentors. This then provides the opportunity to reach out to the respondents.

The absence of a large presence by universities is

contrary to all the other major ecosystems of the world. This may be mitigated by the existing presence of significant incubators and accelerators such as Communitech, Accelerator Centre, the Ontario Discovery Centre with significant support, funding, competitions, mentors, and other start-up and educational sustenance. Also, "graduates" of the various university accelerators such as Ryerson's DMZ may have alumni that identify more closely with their accelerator rather than the university. The rationale for the anomaly would be informing.

Founders have their own networks, but there is room for more connectivity amongst them. Although it may seem contrary to expected thinking, the incidence of entrepreneurs in a large city, dispersed amongst a very large population may result in more isolation, rather than less. Does a smaller-, or larger-city format make it easier or more difficult for tech entrepreneurs to naturally find themselves in familiar surroundings with one another, thereby not benefitting from mutual contacts. While this suggests the vital role of marketing for the events which support organizations are mandated to encourage, it also raises the intriguing question of the role of the large-city ecosystem compared to small-city ecosystems.

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