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# Examining the Connections within the Startup Ecosystem: A Case Study of St. Louis

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**Abstract:** We critically examine how an entrepreneurial ecosystem is structured using an exploratory and bottom-up approach. Past studies in this area have discussed the presence of elements in the system or captured the ecosystem as holistically as possible by extending to social, cultural, and institutional dimension. However, we find that such aggregated conceptualizations gave limited understanding to how different elements are connected and constitute the system. Here, we apply a social network approach by analyzing the connections of the ecosystem at multiple layers: (1) among entrepreneurs, (2) among support organizations, and (3) between and among entrepreneurs and key support organizations. Through a series of interviews with entrepreneurs and support organizations in St. Louis, we find that the ways in which support organizations in this region interacted with each other and with entrepreneurs, including explicit cross-organizational collaboration and strategic structuring of resources, significantly impacted the way that entrepreneurs interacted with one another and with organizations, thus deepening our understanding of these connections and identifying intervening points within the ecosystem.

**Keywords:** entrepreneurship, startup, ecosystem, venture funds

## 1 Introduction

We know that entrepreneurship plays crucial roles in economic development. More than a century ago, Schumpeter (Schumpeter 1912) theoretically uncovered the role of entrepreneurs in the famous process of “creative destruction” or innovation. More recent empirical works have demonstrated that startups and young firms (five years old or less) are significant contributors to the net new jobs in the U.S. (Haltiwanger 2012; Haltiwanger, Jarmin, and Miranda 2013).

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We also know that entrepreneurship is largely a local phenomenon (Malecki 1993; Feldman 2003). For example, Silicon Valley possesses a unique structure and culture that distinguishingly produces corporate and university spin-offs and has thriving networks, where high-profile entrepreneurs and venture capitalists interact (Saxenian 1994; Kenney 2000; Lecuyer 2006). Similarly, nationwide empirical investigation has revealed that the rates of entrepreneurship vary substantially by metropolitan region (Acs and Armington 2006).

Nonetheless, we have limited knowledge about the social and organizational underpinnings of the local system of entrepreneurship. While classic urban development theories (Marshall 1898; Castells 1989) and cluster theory (Porter 1994, 1998b) touched some on entrepreneurship, they largely treated entrepreneurship as one of the peripheral or externality factors. They provided limited analysis of the structure, networks, and content of the local system of entrepreneurship. The same limitation applies to innovation studies, such as those which address regional innovation systems (Cooke 1998; Cooke and Morgan 1998; Lundvall 1992) and the Triple Helix model (Etzkowitz and Dzisah 2008; Etzkowitz and Leydesdorff 2000).

More recent studies, however, have begun to address the content of entrepreneurial ecosystems. Research that has directly discussed this topic has done so largely by identifying a broad list of elements (such as actors and institutions) in the ecosystem (Feldman 2001; Isenberg 2013; Neck et al. 2004) or by capturing the ecosystem as holistically as possible – extending to macro social, cultural, and institutional dimensions (Mack and Mayer 2015; Spigel 2015). As this literature continues to expand, we believe that an understanding of how and how well the elements in an ecosystem are connected is crucial to understanding how the system functions. Thus, we use a multi-level social network approach to investigate the content, structure, and interactions constituting an entrepreneurial ecosystem. We conduct our analysis not only at the micro/individual and meso/organization levels, but also extend it to the intersection between these micro and meso levels, bridging individuals and organizations. Such an approach can enlighten future efforts on how to successfully cultivate entrepreneurial ecosystems and uncover the dynamics of how they evolve. Using the case study of St. Louis, Missouri, we conduct a ground-level observation of entrepreneurs and entrepreneurship support organizations in order to observe these connections concretely and in the greatest detail. We analyze the connections of an ecosystem as separated into primarily three layers: (1) among entrepreneurs, (2) among support organizations, and (3) between and among entrepreneurs and key support organizations. From this analysis, we find that the ways in which support organizations in this region interacted with each other and with entrepreneurs, including explicit cross-organizational

collaboration and strategic structuring of resources, significantly impacted the way that entrepreneurs interacted with one another and with organizations.

## 2 Theoretical Basis

### 2.1 Background

In the past century, the study of entrepreneurship has evolved dramatically, in both level and complexity of analysis. Unchanging, however, is the acknowledgement that entrepreneurship is vital to a market economy, driving scholars and practitioners alike to understand successful entrepreneurship. For many years, entrepreneurship was conceptualized at the microeconomic level as relating to individuals and firms. Van de Ven (1993) summarized that the focal questions of these past studies were who the entrepreneurs were and what kind of individual traits led them to success. Janssen (2009) classified those studies as “internal factor” analyses.

The past few decades, however, have seen a shift in the literature toward a more interdependent, interactive view of entrepreneurship. From a macro perspective, this took hold with Van de Ven’s pioneering work on the “social system framework” (Van de Ven 1993), which identified actors broadly engaged in innovations and entrepreneurship at the local scale, such as the university and its scientific research, financing and insurance arrangements, and a human competence pool. This has led to the current, ubiquitous belief that “the unit of entrepreneurship is not the isolated individual but networks of actors” (Grabher and Stark 1997).

Reflecting this environmental perspective, several studies emerged in the 2000s that contributed to a wealth of knowledge on different elements that may contribute to a successful entrepreneurial system. This has come to be known as the “ecosystem perspective.” For example, Neck and his colleagues (Neck et al. 2004; Cohen 2006) cultivated their entrepreneurial framework from observations in Boulder, Colorado, and identified six elements that contribute to a system of entrepreneurship: incubators, spin-off firms, formal and informal networks, physical infrastructure, and culture. Feldman (2001) uncovered that pioneering entrepreneurs, supportive social capital, venture capital, entrepreneurial support services, and engaged research universities constituted the successful establishment of an entrepreneurial culture in the Washington D.C. area. Similarly, Mack and Mayer (2015) investigated the regional entrepreneurial ecosystem in Phoenix, Arizona, from an evolutionary perspective. Like

Feldman's approach, they identified elements based on a literature review and asked how each interviewee perceived the state of each element in the region.

Additional recent studies have pointed out the importance of spin-offs from local anchor firms and "entrepreneurial recycling," (originally termed "flexible recycling" by Bahrami and Evans 1995, and later "entrepreneurial recycling" by Mason and Harrison 2006) in which successful entrepreneurs cash-out to start new and even more successful companies (Mayer 2011; Mason and Brown 2014; Stam 2015; Spigel 2015). While these findings could have powerful implications, the roots of those spin-off firms, or recycled entrepreneurs, could be identified only retroactively, and did not help in understanding the current conditions of the ecosystem or the methods needed to generate more spin-offs or recycles.

Thus, the major limitation of these past studies was their focus on identifying elements without an analysis of the relationships between those elements. Without understanding the way the elements of an entrepreneurial ecosystem interact, we cannot understand the ecosystem dynamics. The limitation becomes particularly apparent when the interactions between elements, such as networks and social capital, are identified as elements of the ecosystem (Feldman 2001; Neck et al. 2004). Our primary objective is to shed light on how the various elements of an ecosystem may interact, as well as to disentangle those interactions from the elements themselves.

Incidentally, the major elements identified by the past studies of entrepreneurship ecosystems resembled those of cluster theory. This began with Porter (Porter 1994, 2000), who's aim was to holistically summarize industrial agglomerations. He listed risk capital (such as venture capitalists), specialized support services, research universities and corporate research labs, core customers, and a labor force (Porter 1998b). His stylized diagram of the wine industry in California (Porter 1998b) displayed a loose configuration of related sub-sectors, yet it fell short in explaining how and how much those actors were connected (Motoyama 2008). So far, the entrepreneurship ecosystem literature has followed the same trajectory.

Here, we hold a close view with Breznitz and Taylor (Breznitz and Taylor 2014), who criticized the past "element-focused framework." They conducted a case study of Atlanta, Georgia, which scored high in all elements of the ecosystem, such as highly-ranked research universities, anchor companies, skilled labor, venture capital funding, and favorable policies, but which performed poorly in entrepreneurial outcome. Instead, they called for the "structure-focused approach" in which they analyzed "the structure of the relationship among agents, be they firms, individuals, associations or governments within the cluster" (2014, 376). Their case highlights the importance of the idiosyncratic value of elements in a given system as well as the importance of how organizations interact with each other and local entrepreneurs.

In our effort to investigate actors and connections between elements, we adopt the unit of analysis and methodology used by social network studies. There is a rich literature on this subject as various scholars have investigated the influence of individuals' network patterns on entrepreneurship from a micro perspective. Notably, building on Granovetter's (1985) work, Aldrich and his colleagues (Aldrich and Martinez 2005; Aldrich, Rosen, and Woodward 1987; Aldrich and Zimmer 1986) emphasized the critical importance of the embedded nature of entrepreneurial activity in a surrounding social context. Jack and Anderson (2002) and McKeever et al. (2015) have built on this line of research by linking social embeddedness with the type of opportunities an entrepreneur sees and thus the type of venture they start, concerning both social and economic spheres. Research has also investigated the role of social ties for outcomes of entrepreneurial ventures in greater detail, such as questioning if volume of networking activities by entrepreneurs is related to individual firm success (Witt 2004) and how an entrepreneur's network may systematically vary according to the stage of his or her venture (Greve and Salaff 2003).

While past social network analyses have examined individual connections at the micro level, we extend our analysis at the meso level, seeking to understand how connections among individuals, between individuals and organizations, and among organizations, come together to form the ecosystem as a whole. Our premise is that our micro- and meso-level approach will allow us to identify and measure the clear connections between actors, agents, and organizations within an ecosystem, rather than examining aggregated elements, such as universities, research labs, industries, labor, and policy. We discuss the operationalization of this micro- and meso-level analysis in the next section.

## 2.2 Scope and Framework

First, we focus on a specific segment of the entrepreneurship ecosystem by applying the approach developed by Lyons, Lichtenstein, and their colleagues (Lichtenstein and Lyons 2006; 2010; Lichtenstein, Lyons, and Kutzhanova 2004; Lyons et al. 2012). They emphasize segmenting the pipeline of entrepreneurs and firms according to stage of development, and cultivating specific skills in entrepreneurs as a method of economic development. Moreover, they point out that such skill development can be facilitated intentionally and structurally by forming a community of entrepreneurs. For instance, this could occur at an incubator or by bringing together otherwise geographically dispersed entrepreneurs, as in Saskatchewan (Lichtenstein and Lyons 2012). Within this

framework, we focus on the beginning of the pipeline, or earliest stage of a venture: the startup. In doing so, our intent is to begin our integrative analysis from the simplest angle. Further, by taking this approach, we narrow our focus to the skill attainment and learning of entrepreneurs, as opposed to capital attainment.

Second, as we seek overall to understand entrepreneurial ecosystems as networked structures, we conduct a highly exploratory analysis of elements and connections between elements within an ecosystem. Here, we integrate the analysis of micro and meso levels and propose a multi-level framework. Our first level of observation starts with the fundamental question: at minimum, what constitutes an entrepreneurial system? Our answer is entrepreneurs, which is the level that the bulk of social network analysis has focused on. Until entrepreneurs are present, incubators have no one to incubate and VC firms have no one to fund. These things may be present, but by definition there is no entrepreneurial activity without entrepreneurs. Then, those entrepreneurs use or need resources – funding, training, and other things that otherwise enable them to start their businesses and obtain the skills they need to move through the pipeline. Thus, our next level of observation is the entrepreneurship support organizations and their connections to other similar organizations, which is the level that the past entrepreneurship ecosystem literature has primarily focused on.<sup>1</sup>

Lastly, we seek to understand the connections beyond what the two bodies of literature, entrepreneurship ecosystems and social networks, have discussed independently and extend our analysis to the interaction between individual entrepreneurs and support organizations. Support may come from individuals as well as organizations, however – such as angel investors or more experienced entrepreneurs. As such, we also investigate interactions with individual supporters within the ecosystem.

Thus, we seek to discover the content and use of connections within a system and consider entrepreneurial networks not as an element in the system, but as the overarching structure of the system itself. We investigate the interactions among entrepreneurs themselves, between entrepreneurs and support organizations, among support organizations, and with other supporting individuals. Through this highly exploratory, descriptive, and bottom-up approach, we attempt to minimize the normative debate about what the system should look like, and to maximize conceptualization of the ecosystem through entrepreneurs' perspective of the connections in the system.

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<sup>1</sup> The subject was not about entrepreneurship, but Redaelli (2011) analyzed the connections between anchor artist support organizations, which is an equivalent of this level of analysis at support organizations.

### 3 Situating the Case of St. Louis

We sought to investigate a region that has not been known as a hub of entrepreneurship, but one that has been undergoing a substantial transformation with its local entrepreneurship scene. Though there were many cities that fit these criteria, St. Louis, Missouri stood out as a good candidate for a few reasons. Our ground-level observations indicated that the landscape of entrepreneurship had changed substantially in the previous few years (Duttia, interview, 24 August 2012; Harrington, interview, 10 December 2012). Similarly, the macro-level data of Business Dynamics Statistics demonstrated an especially sharp recover of startup creation in 2010 and 2011, much higher than the national rate. While we cannot prove that this newly changing landscape of entrepreneurship in St. Louis will sustain and fully develop, we believe that there is a convincing amount of evidence to indicate the early evolution of the ecosystem in the region.

Next, we provide a very brief history of the region and describe our sample population. Throughout the last half century, St. Louis has been largely known as a “big business” city, home to many stable national and global corporations. Anheuser-Busch, Nestlé Purina Petcare, Emerson Electric, Enterprise Rent-A-Car, and A.G. Edwards are just a few of these. During the 1990s, however, the city saw the perpetuation of many years of economic decline. For instance, Southwestern Bell Communications (now AT&T) relocated its headquarters from St. Louis to San Antonio, Texas in 1993 (Pederson 2000); the Great Flood of 1993 devastated the region (Larson 1996); McDonnell Douglas was purchased by Boeing in 1996 (Knowlton 1996); and later Anhauser-Bush was purchased by Belgian-Brazilian company InBev in 2008 (De la Merced 2008). The restructurings by so-called “anchor firms” led the region to undergo significant economic changes, particularly reflected with a reduction in manufacturing jobs, downsizing and acquisition of major corporations, and decline and then gentrification of the urban metro area. Combined with the nation-wide economic downturn of 2008, the late 2000s saw St. Louis as a city with a surplus of skilled, unemployed workers and a need for new engines of economic development.

Both the public and private sectors spent enormous efforts to reinvent the region, such as the state economic development agency, the Greater St. Louis Chamber, local universities, and even prominent community figures such as John McDonnell and Bill Danforth. Further, two reinvention strategies emerged by 2010: the Mosaic Project, to attract immigrants to the area, as well as the promotion of entrepreneurship. Washington University’s Skandalaris Center for

Entrepreneurship, founded in 2003 through a grant from the Kauffman Foundation, has become progressively more involved with the community and many other entrepreneurship support organizations have launched since 2011 (see Table 1).

**Table 1:** Entrepreneurship support organizations in St. Louis

Organization	Services	Target industry	Founded
Missouri Venture Forum	Networking and pitch forum	All	1985
SLU Entrepreneurship Center	University student support	All	1987
Missouri Technology Corporation	Funding, Programming	Tech, bioscience	1994
Regional Growth Capital	Venture capital	All	1994
Center for Emerging Technologies	Space, funding, programming	Bioscience, medical, tech	1998
Skandalaris Center (Washington University)	University student support	All	2001
CORTEX	Office space	Biotech	2002
BioGenerator, BioSTL	Funding, lab space, mentorship	Biotech	2003
Arch Angels	Angel investment	All	2005
Billiken Angels	Angel investment	All	2007
Gateway VMS	Mentorship	All	2007
ITEN	Mentorship, programming	Tech	2008
UMSL Entrepreneurship Center	University student support	All	2008
Arch Reactor	Makers space	All/Products	2009
Nebula	Incubator	All	2010
The Mission Center	Incubator, accelerator	Social enterprise	2010
Capital Innovators	Accelerator	Tech	2011
T-Rex	Incubator	Tech	2011
Arch Grants	Business competition/grant	All	2011
Accelerate STL	Resource left	All	2012
Cultivation Capital	Venture capital	Tech and life sciences	2012
Hive 44	Incubator	All	2012
Lab 1500	Incubator	All	2012
STL Venture Works	Incubators	All	2012
WEST	Events, Mastermind mentorship groups	Women	2012
1 Million Cups	Presentation forum	All	2013
iSelect Fund	Venture capital	All	2013
SixThirty	Accelerator	Fin-Tech	2013
Cambridge Innovation Center (CIC)	Incubator	All	2014

(continued)



Table 1: (continued)

Organization	Services	Target industry	Founded
CLAIM	Co-working space	All	2014
St. Louis Makes	Research and events	Manufacturing	2014
Tech Artista	Incubator	All	2014
Prosper	Accelerator, Mastermind mentorship groups	Women	2014
Venture Café	Networking, events	All	2014
The Yield Lab	Accelerator	Ag-Tech	2014

One such support organization was Arch Grants, a non-profit corporation, founded in 2011 by Joe Schlafly, a venture capitalist and proponent of St. Louis economic development, Jerry Schlichter, a lawyer invested in the success of the region, Bob Guller, owner of a real estate management and investment firm, and Zack Boyers, a CEO with a background in banking. Though a non-profit itself, Arch Grants is supported by a collaboration between several organizations in both the public and private sectors (Motoyama and Knowlton 2016). The goals of Arch Grants are to make St. Louis an attractive place for startup businesses to launch from and to increase employment growth in the city through startups. To do this, Arch Grants holds an annual business plan competition, which awards a package of prizes to each of 20 winners. Arch Grants seeks companies that are early stage, scalable, and have unique ideas. Each recipient receives \$50,000 in equity-free cash. In return, companies who accept the Arch Grants award must agree to locate their business in St. Louis for the following year.<sup>2</sup> Startups from any sector may apply to be considered. It is worth noting that such interventions by the public sector have not been thoroughly considered in past ecosystem evaluation studies, in particular incubators (Amezcuca 2010) and public venture funds (Lerner 2009).

### 3.1 Methods

After learning about Arch Grants, we chose the 2013 class of recipients as our sample of startup entrepreneurs. In selecting a sample, we sought a collection of startups that had shown some measure of success by generating revenue, that

<sup>2</sup> Arch Grants does allow a few recipients to locate outside of the downtown St. Louis area. A startup may be granted this exclusion if the “nature of their business precludes them from” doing so, in which case the business must receive permission to locate elsewhere in the St. Louis region (Arch Grants 2014).

had heterogeneity across industries and backgrounds, and that we believed would give us a window into the startup community of St. Louis. We chose the 2013 cohort because they would be more likely to be working in St. Louis, under the rules of the Arch Grant, and thus more likely to be available for an in-person interview, than other cohorts. In selecting this sample, we did not assume that receiving an Arch Grant necessarily made an entrepreneur successful, but that it was a signal that a firm was able to launch its business with a modest amount of cash awarded by the semi-public sector. Furthermore, any collective efforts between the public, semi-public, and private sectors that are captured by our research can demonstrate a case with direct policy implications.

The 20 recipients were from various sectors, with products and services ranging from women's triathlon apparel to mobile advertising solutions. For purposes of this report, we anonymized startups according their sector. We classified eight companies as "Biotech," another eight companies as "IT/Information Services," and the remaining four as "Other" – which were either manufacturing or education focused.

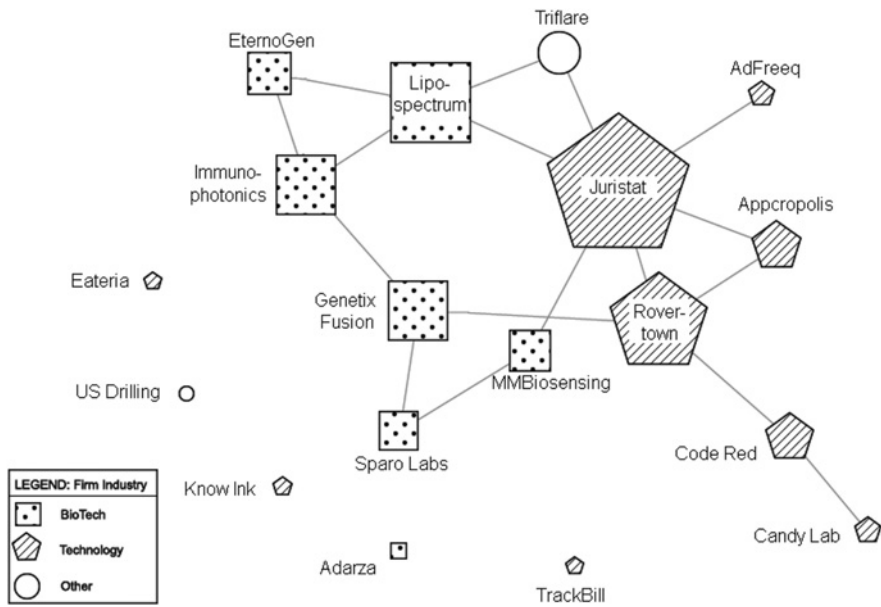
We interviewed the Arch Grant recipients in late 2013 and were able to reach 16 out of 20 of them (80%). Three companies had multiple founders participate in the interview, leading to 21 total interviewees, of which two were female (11%). To uncover network interactions, the firms were asked where and from whom they had received support for their startup, as well as what form that support took. Then, we expanded our interviews to key support organizations that those startup companies mentioned in their interactions. This included seven support organizations. While these entrepreneurs and support organizations are the core of our analysis, we conducted additional interviews with people who were identified by entrepreneurs, such as mentors and other entrepreneurs outside the Arch Grants recipients, and also supplemented with multiple field observations of networking and speaker events within the ecosystem.

## 4 Analysis

Based on our theoretical motivation of applying a social network perspective to entrepreneurial ecosystems at the meso-level, we separate our findings into four "layers" in order to uncover what is happening both between and among individuals and organizations. Taking a systematic approach, we look first at individual entrepreneurs, next at entrepreneurship support organizations, and then at the interactions between these. More explicitly, our four layers are (1) entrepreneurs among themselves, (2) support organizations among themselves, (3) between entrepreneurs and support organizations, including layers (1) and (2) as well, and finally (4) all of the above connections, also including secondary support actors such as

individuals, events, universities, and corporations. Separating our analysis this way allows us to isolate the individual and meso levels before integrating them, so that the meaning and attribution of findings can be more clearly identified.

Beginning with the first layer, we examine the interactions among startups within the 2013 Arch Grant cohort. About two thirds of the Arch Grant recipients expressed any type of meaningful interaction with the other startups. We consider meaningful interactions to be those that influenced either the entrepreneurs or their startup and were more significant than simply seeing the other firm around town. The content of these connections varied, including emotional support, technical advice, business advice, and resource advice, as described in greater detail below. Figure 1 visualizes these relationships.



**Figure 1:** Connections among Arch Grants 2013 cohort recipients

Note: We interviewed 16 companies, but show 18 because two non-interviewed companies were mentioned by our interviewed companies. We omit the other two companies because we cannot assess whether they are truly disconnected from the others.

The connections shown are non-directional and could have been expressed by either or both parties. The size of each shape represents the number of connections (ties) attached to it within this sample; for example, Junstat shows six connections to other startups, while Candy Lab shows only one. The size of each shape is a direct result of this number. Thus, the shape representing Junstat is much larger than the one representing Candy Lab. As explained above, a

connection constitutes a meaningful relationship from one startup to another, as expressed in the interviews. The shapes represent the different sectors, according to the legend: Biotech are squares, IT are pentagons, and Others are circles. Of the sixteen recipient companies we interviewed, twelve mentioned active relationships, while four others did not mention any specific ties to the others. A few of the twelve companies were more active within the cohort and expressed four or more connections to other companies. Though, most companies expressed at least two connections.

As would be expected, biotech firms mainly had connections with other biotech firms, and IT firms mainly had connections with other IT firms. Coming from common industries allowed certain startups to help each other with specific challenges, for example: “What we wanted to do as the Arch Grant recipients and being in life science space is that we wanted to get together and start working on these [government] grants ourselves. So, I’ll get feedback from them on my grant and give feedback to them” (Biotech Firm A). The variety of industrial sectors among the Arch Grants recipients did not limit connections, however, as interactions extended beyond those sectors. “You’re doing completely different things. You’re all building something and that involves kind of the same thought process, I like to think. Different expertise, but definitely the same thought process” (Biotech Firm B). Another example that can be seen in Figure 1 is Triflare, a triathlon apparel company with connections to both an IT firm and a biotech firm. These interactions created a social environment in which the entrepreneurs could not only learn from their peers, but also support each other emotionally through the rough and uncertain journey that all entrepreneurs face.

These relationships suggest that the distribution structure used by Arch Grants, of awarding a grant to twenty companies, created a community among the recipients because this common tie allowed recipient companies to closely observe each other and provide feedback about their businesses to one another. This was aided by the variety of industries present, as the startups did not see all of the other grant winners as competitors. This sense of community was explicitly expressed in interviews as follows: “He [a founder of another Arch Grant recipient] is a nice guy and he’s really intelligent. He gives me a lot of advice, but I know I also bother him. But all of us grant recipients are friends, and it’s like a fraternity or sorority” (Other Firm A). “It’s a great environment. I had some questions about some of the frameworks that they [another recipient company] are using, and sometimes other people stop by and ask me things: What do you think about this idea?” (IT Firm A). The same entrepreneur continued to bring in a further example: “This guy came yesterday and he almost pulled my ears. He said ‘You’re going to need more customers. You have enough traffic, and people that are engaged with you. Now you should put time on selling this.’ I said ‘OK,

let’s have a second conversation and see what you’re doing on your side because you need more traffic” (Ibids.).

These interactions quickly lead us to the second and third layers of connection, which include key entrepreneurship support organizations in the region. The second layer of connections is only among major support organizations. Here, many of the connections we identified were not informal relationships, but strategic and functional ones. For instance, three support organizations had a monthly brownbag lunch to exchange information: ITEN, a support organization for information technology startups, BioGenerator, a similar one for biotech and pharmaceutical startups, and STL VentureWorks, which provides incubation space. This type of purposeful, coordinated relationship was also reflected in cross-over board memberships; for instance, between STL VentureWorks, Cultivation Capital, and ITEN. Furthermore, the executive director of InnovateVMS, a mentoring service provider, had her previous career at the Skandalaris Center at Washington University in St. Louis, under a major grant initiative from the Kauffman Foundation. Thus, her tie to both organizations led them to naturally collaborate and share their networks of mentors. Moreover, two founders of Capital Innovators, an accelerator program, served as the mentors of companies supported by ITEN. In addition to the tight, formal web of connections, other, loose connections included representatives attending events organized by other organizations, serving on a panel at those events, and jointly organizing events. Formal and informal relationships among the support organizations are visualized in Figure 2.

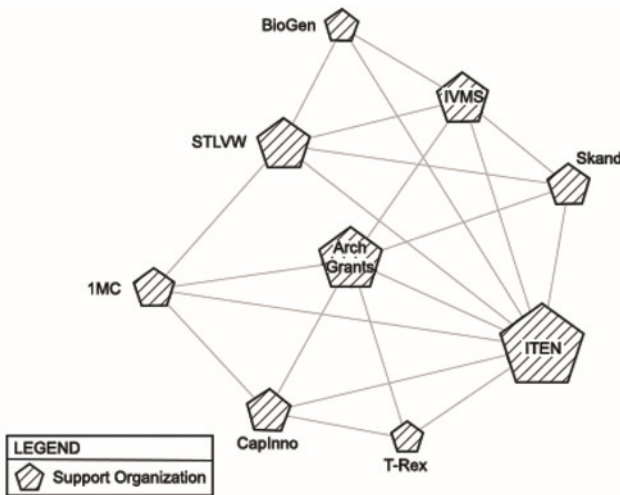
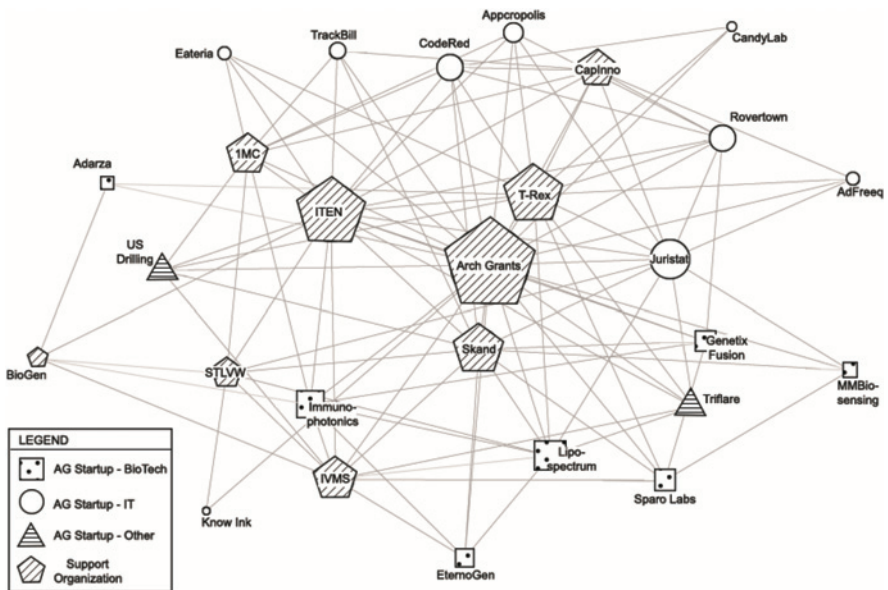


Figure 2: Connections among support organizations

Again, the size of each shape represents the number of connections (ties) attached to it within this sample.

In the third layer of interaction, we synch layers one and two to reveal the connections between the Arch Grant recipient companies and the major support organizations, as well as among these two groups. Figure 3 depicts these relationships, which creates a dense network.



**Figure 3:** Connections between and among Arch Grant 2013 recipients and support organizations

Note that of the five companies that appeared disconnected in Figure 1, Figure 3 demonstrates that none of those five companies were isolated. Indeed, they all had connections to other Arch Grant startups through one and sometimes multiple support organizations.

Detailed information from interviews reveals multiple stages and layers of support provided by different supporting organizations. For example, IT Firm C described their development process and received support as follow:

- We were then based in Chicago. He [another entrepreneur in St. Louis] set a date and introduced us not only to Capital Innovators [an accelerator], but also Arch Grants and even to Cultivation Capital [a venture capital firm]...
- At the demo day of the Capital Innovators, he [an angel investor] approached us and said he's interested in investing. That helped us bridge

between Capital Innovators and Arch Grants, because we didn't get the money from Arch Grants until July 1st. It also gave us a bargaining chip with Cultivation Capital.

- Probably, our biggest mentor to date has been Brian Matthews, who was our lead advisor and mentor for Capital Innovators, and he's also a principal at Cultivation Capital.
- We hired two students from WashU [directly]. The Skandalaris Center was already done matching students with companies.

These remarks show that the financial support from Arch Grants, from an accelerator, and from a venture capital firm did not act in isolation. Instead, the startup bridged their various stages of financing through strategic resource management and using the connections between different organizations.

Other Firm B expressed that the genesis of their company was at a Missouri Venture Forum meeting, a monthly meeting attended by over a hundred investors, entrepreneurs, service providers, and job seekers. One founder presented an idea in the two minute forum, the other founder liked the idea, met the presenter, and they subsequently wrote the business plan together. The founders of this firm periodically attended meetings held by ITEN, 1MC, and the Skandalaris Center. One of the founders served as a judge for the business plan competition put on by the Skandalaris Center. Lastly, this firm also received mentoring from Innovate VMS.

Other Firm C directly mentioned the links between the organizations, saying “the Arch Grants got us to ITEN, which got us to the business journal, which put us in touch with some of our client contacts. ITEN is a validity thing. They got us into the Startup Connection at the Science Center, where we won people's choice...” “Then, ITEN put us in touch with Capital Innovators, which gives us practice in just pitching and selling, which is really valuable practice.”

In this way, the interviews revealed that the connections between support organizations were not simply inter-personal connections in which directors of different organizations knew each other formally or informally. Instead, the fact that a company received support or completed a program through one support organization functioned as a recognized accomplishment and as a type of validity screening for other support organizations. Interviews with those support organizations further reveal that the directors of the support organizations exchanged highly detailed information about specific companies, such as what stage the company was in, the strengths and weaknesses of the company, and how they had worked with the company in the past (Interview, Brasunas, 1 August 2013; Interview, Chmelir, 1 August 2013). These periodic conversations between support organizations helped to avoid unintentional and unnecessary overlaps in support. At the same time, some support and training took place



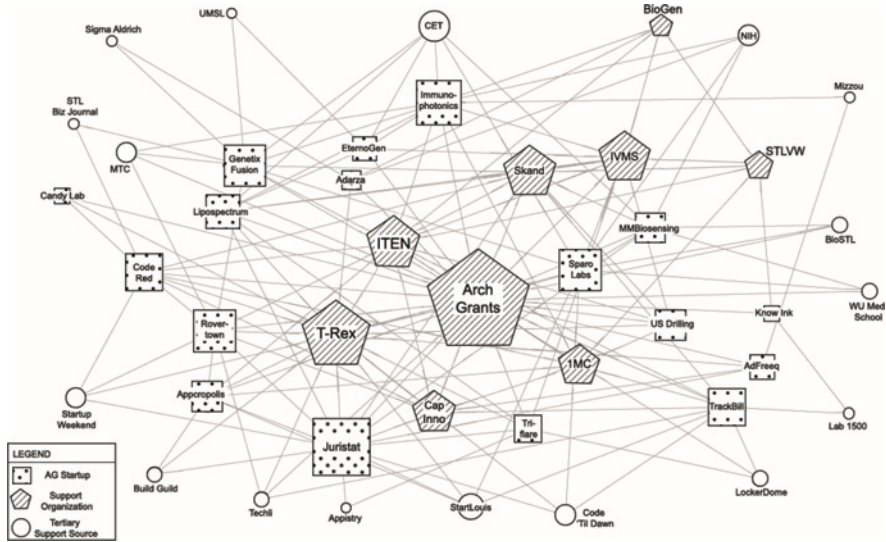
continuously through different support organizations; for instance, the reformulation of a business model and the expansion of one's customer base were not a one-time event, but a continuous process evolving over time.

The last and fourth layer of connections we observed goes beyond entrepreneurs and formal support organizations, to include other miscellaneous actors. These connections include other entrepreneurs in the area, periodic entrepreneurship-oriented events, community-led organizations, universities, and local corporations. To begin with, the connections to other entrepreneurs extended beyond the 2013 cohort of Arch Grant recipients. The Arch Grant was awarded to fifteen companies in 2012, in addition to twenty in 2013, and several from the 2012 cohort interacted heavily with the 2013 cohort. For instance, IT Firm B expressed that they frequently interacted with three recipients from the 2012 cohort. Manufacturing Firm A mentioned that founders of two companies from the 2012 cohort served as informal mentors. Additionally, one founder in the 2012 cohort served as a mentor for two companies in the 2013 cohort. Therefore, the peer learning effect was not limited to immediate peers. With these companies, one year seemed to make enough of a difference in terms of the learning curve and business development that "older" companies could give useful advice. Thus, the need for highly senior, experienced entrepreneurs to serve as formal mentors was somewhat mitigated by the mixture of grant cohorts, creating interactions that would evolve into informal mentorships. Further, though only the 2012 and 2013 cohorts had been awarded at the time of data collection, future research may investigate how this cross-cohort learning has developed as Arch Grants has continued to create new cohorts.

To keep the network map relatively simple, Figure 4 depicts only fourth-layer connections mentioned by at least two firms in the 2013 cohort of Arch Grant recipients. To distinguish from earlier figures, the newly identified actors are shown as white circles. As before, size of each shape represents the number of connections (ties) attached to it within this sample.

Interviews further revealed mentoring relationships with four local individuals with previous entrepreneurial experience. These individuals actively served as mentors for six of the companies interviewed. We could not identify any specific patterns of how the entrepreneurs found those mentors: It could have been by attending one of the entrepreneurial events (discussed below), by an introduction from a support organization, or by a referral from a completely unrelated acquaintance. However, the presence of these four local mentors, commonly serving multiple Arch Grant recipients, suggests that the way startup entrepreneurs and experienced entrepreneurs met was not random. Instead, it is more likely that the networks of those experienced mentors were within specific circles. Once startup entrepreneurs got into those circles, they were able to build





**Figure 4:** Extended connections between and among Arch Grants recipients, support organizations, and other supporters

relationships with these mentors relatively quickly, within a matter of a few months. These mentors were experienced entrepreneurs who were highly active in this community and supportive of startups. The startups connected to them mentioned that they were generous, voluntary mentors who were willing to give back to the next generation of entrepreneurs.

In addition to connections to mentors, there were seven entrepreneurial events that multiple entrepreneurs mentioned they attended and found valuable. These were open events organized by additional entrepreneurship support organizations (not shown in Figures 2 and 3), such as BioSTL, Lab 1500, and the Center for Emerging Technologies (mentioned in Table 1). Moreover, we identified four other events that were not run by these kinds of formal organizations, but by groups of grassroots volunteers: Startup Weekend, Start Louis, Build Guild, and Code 'Till Dawn. Table 2 briefly describes each event.

Five out of six biotech firms mentioned connections with local or regional universities: University of Missouri at Columbia (Mizzou), University of Missouri at St. Louis, and Washington University School of Medicine. The common pattern we observed was that the founders were graduate students or postdoc researchers at each campus and then started companies based on technologies and expertise that they were trained in. In other words, these firms did not begin with entrepreneurs reaching out to the universities to find technologies for

**Table 2:** St. Louis events attended by multiple entrepreneurs

Event name	Description
Build Guild	A monthly meetup of web professionals
Code 'Till Dawn	A monthly all-night coding event
Start Louis	A monthly meetup of solo-entrepreneurs and startup enthusiasts for learning and collaboration
Startup Weekend	A weekend activity in which instant teams work on business plans and compete for prizes

commercialization. Nor were there cases, in our sample, of entrepreneurs from the community and professors working together on technology commercialization. The role of professors was rather restricted; they either introduced entrepreneurs to other academic researchers in related fields, who were not necessarily based in St. Louis, or served on the advisory boards of the companies. Note that serving on the advisory board of a company was completely different from being involved in operating that company or serving as a business mentor. For these biotech firms, the board role was usually limited to advice on specific scientific and technological matters.

Two other miscellaneous institutions are worth mentioning. While we did not identify involvement by traditional economic development agencies, we did see involvement by the Missouri Technology Corporation (MTC). MTC was a semi-public state organization that aimed to promote new and high-tech companies (MTC 2013). Three companies expressed the use of MTC's Venture Capital Co-Investment Program. This gave MTC indirect involvement because the initial investment decision was made by a local accelerator or venture capital firm, with MTC providing matching funds.

Lastly, two interviewees mentioned the St. Louis Business Journal as giving valuable support. In both cases, the local media functioned as a validity instrument by publishing an article about a startup or giving an award such as "30 under 30." The entrepreneurs reported that this type of publicity opened up doors for new connections to customers or otherwise valuable business connections.

## 5 Discussion

Our findings from this ground-level observation of the St. Louis startup ecosystem reveal many rich details regarding the content and structure of the ecosystem, and

in particular, details of the cross-level connections between entrepreneurs and support organizations. As we apply a social network perspective to combine the individual and meso levels, our findings reveal that the way in which support organizations interact significantly impacts how and why entrepreneurs connect.

Past studies taking an ecosystem perspective have done little to examine the nature of connections among entrepreneurs, which surfaced as one of the most important aspects of our observations. While some studies have discussed the necessity for a critical mass of entrepreneurs to build an ecosystem (Neck et al. 2004), or the need for enough of the *pioneering* (experienced) types of entrepreneurs (Feldman 2001), this focus on quantitative size neglects the critical component of interaction. Our findings build on past work by showing the importance of not only having pioneering entrepreneurs, but of having a mixture of nascent and pioneering entrepreneurs, and creating a context in which they can meet and interact on a regular basis, in a non-competitive nature. Such interactions should not be taken lightly, as we found that entrepreneurs learned an immense amount from each other and from mentors who had entrepreneurial experience. Further, we note that this learning process occurred largely outside of educational training from universities. It consisted of the transfer of experiential knowledge acquired through interactions with people and experimentally applying ideas to a tailored case that a given entrepreneur was facing.

The most influential elements of the startup ecosystem, based on our inductive and bottom-up approach, were rather parsimonious: entrepreneurs, support organizations focusing on entrepreneurship, supporting individuals and investors, entrepreneurial events, and universities. Here, discussing the presence of these elements is not our primary objective. Instead, our observation and induction leads to a more nuanced understanding of how the ecosystem is structured, particularly about how each element, as well as organizations and individuals within each element, is connecting and constituting the system. We organize our discussion around four topics: (1) individual connections and the regional culture, (2) geography and co-location within a region, (3) types of organizations and support, and (4) university support.

## 5.1 Connections as Representative of Culture

Many past economic geography studies have used broad terms such as culture (Neck et al. 2004; Cohen 2006) or social capital (Feldman 2001) in describing an entrepreneurial ecosystem. Scholars who have studied cultures of organizations and populations have put forth definitions varying from culture as “shared systems of meaning” (Hofstede 1980), to culture as “ (a) a pattern of basic

assumptions, (b) invented, discovered, or developed by a given group, (c) as it learns to cope with its problems of external adaptation and internal integration, (d) that has worked well enough to be considered valid and, therefore (e) is to be taught to new members as the (f) correct way to perceive, think, and feel in relation to those problems” (Shein 1990). While these concepts are helpful in expressing vague phenomenon, alone they lack the power to decompose the structure or process of connections between people and organizations. For example, embracing a “risk-taking culture” is indeed important, but where does perception of this culture come from? It will emerge when specific role models, processes, and networks are present. We believe our research has deepened understanding of cultural evolution in this way. That is, mentorship between experienced and nascent entrepreneurs provided role models, and the way that support organizations structured their programs, events, and resources shaped the development of connections among those entrepreneurs, forming the processes and networks that became the framework for the local entrepreneurial culture.

Recent empirical work by Huggins and Thompson has delineated indices of a regional community’s culture that impact rates of entrepreneurship, including a community’s (1) engagement with education and work, (2) social cohesion, (3) femininity and caring attitudes, (4) adherence to social rules, and (5) collective action (Huggins and Thompson 2015). This work provides a much-needed connection between ideas and opaque experiences of culture and measurable behaviors. We go even further to show a primary tool by which these indices are enacted and spread – through intermediary support organizations and the interactions they create. Our qualitative and interaction-based analysis shows how a region’s culture may influence not just rates of entrepreneurship but the nature of an entrepreneurial ecosystem that develops. Attitudes toward risk-taking circulated as entrepreneurs shared what they had been going through, leading to a broad perception of how safe it was to take risks in this environment. Further, as entrepreneurs commented on each other’s plans and received feedback on their own, they could help each other improve. This mutual process of reciprocity was perceived as a supportive culture. While it is difficult to change the general culture of a people or region from a top-down approach (Griswold 2013), we find that meso-level organizations may be able to adjust these micro-level, specific ways in which people interact, thereby changing the higher-level culture in a bottom-up fashion.

We note that these connections, used for feedback and learning between entrepreneurs, were not present in St. Louis several years ago. A director of a support organization expressed the common sentiment in this analogy:

The typical problem I saw with entrepreneurs five years ago was like this: “I do this business alone, and I don’t know other startups in town. I don’t know investors here, and there is only old money by big corporations in St. Louis, so I go to Silicon Valley to find an investor.” Then, if you talk to investors, they would say: “I don’t find any prospective startups in St. Louis, and, in fact, there may not be any startups here, so I go to Silicon Valley to find companies to invest.” So somehow, they might find each other in Silicon Valley, but not in St. Louis. (Brasunas, interview, 10 December 2012).

These remarks present a sharp contrast to how our interviewees currently perceived the supportive and friendly environment of the area. Generally, culture is believed to change over long periods of time, but we found the specific ways people interacted changed in a matter of five years, and our findings suggest that this was due in large part to the role that the local entrepreneurial support organizations played.

### 5.2 Geography within St. Louis

Geographic density surfaced as an important catalyst contributing to the interactions among entrepreneurs and between entrepreneurs and support organizations. The locations of entrepreneurs and support organizations were extremely concentrated, as shown in Figure 5.

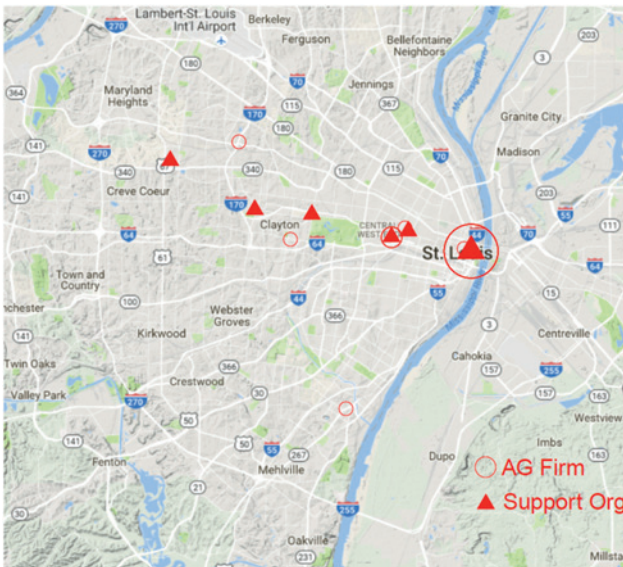


Figure 5: Map of Arch Grants recipients and support organizations

Here, we see scattered activity except for two areas of high concentration. The first is in downtown St. Louis, more specifically at 611 Olive Street,<sup>3</sup> where eight Arch Grants recipients and three support organizations resided (from those interviewed). Close to the Mississippi River, this location was a former department store building, built in 1914. At the time of the study, it housed T-Rex, a space provider for entrepreneurship, which occupied five floors. In addition to the eight Arch Grant recipients of 2013, there were 72 other startup firms operating in the space. The second area of increased concentration is between downtown and Forest Park, more specifically at 4041 Forest Park Avenue. At the time of our study, this area was being developed into a technology park known as CORTEX. The 4041 building housed two support organizations, the Center for Emerging Technologies and BioGenerator, as well as three of our interviewed biotech firms. Arch Grants did not require, but encouraged its recipients to be located in one of these two facilities.

We cannot make a pure causal argument, but we do observe that these physical colocations substantially correlated with the interactions among firms. Arch Grants required its recipients to relocate to the St. Louis area for at least one year as a condition of the grant. Three out of twenty recipients had not completely moved to St. Louis yet, at the time of the interviews, and we identified the least interaction between these startups and other recipients or support organizations. In contrast, the most interactive companies were located either at T-Rex or on Forest Park Avenue.

Proximity alone is not sufficient, however, to create an interacting community of entrepreneurs. As Lichtenstein and Lyons (2006, 2010) rightly stressed, even entrepreneurs within the same incubator will not necessarily interact. But, catalytic activities to connect them are crucial, often led by a person who can diagnose and assess different stages of development of entrepreneurs. Within St. Louis, these two conditions were met: entrepreneurs who were connected through their Arch Grants cohort and colocation, as well as the support organizations, also located in the same facility and who provided trainings and organized catalytic activities for the entrepreneurs.

### 5.3 Types of Organizations and Support

The interviews revealed that different support organizations in the region provided somewhat overlapping yet still different types of support, based on startup

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<sup>3</sup> The T-Rex facility moved to 911 Washington Avenue in February 2014, six blocks from 611 Olive Street.

**Table 3:** Types of primary supports provided by key support organizations

Organizations	Broad				Functional			
	Mentoring	Finding talent	Connect	Financial	Refine business model	Practice pitching	Due diligence	Space/ Incubation
ITEN	X	X	X		X	X		
Skandalaris Ctr		X			X			
BioGenerator	X			X			X	X
INNOVATE/VMS	X		X					
Cap. Innovators	X		X	X	X	X		X
STLVentureWorks	X							X
CET	X				X			X
T-Rex			X					X

stage and function. By analyzing the open-ended interview question “What kinds of support do you provide?”, we identified the primary types of support offered by each organization and categorized these in Table 3. This table is not intended to be comprehensive, but it still captures what each organization considers its primary support offerings, and displays a good amount of overlap among the organizations.

We classify the support offerings into two large categories. The broad support types are mentoring, finding the talent, connecting, and financial. The functional support types are more specific, such as refining the business model, practice pitching to investors and customers, due diligence, and space. Note that the orthodox kinds of support for economic development (financial and incubation space) were only two of the many functions that these support organizations provided. Moreover, there was no organization that provided money or space alone. The support organizations provided these traditional types of support in conjunction with other types of support.

Previous studies on entrepreneurship ecosystems have provided little discussion of the content of support services, but rather treated them as a black box. At best, Feldman (2001) identified entrepreneurial support services as one of the elements of the ecosystem and observed somewhat different types of support. We find a number of different types of support, separated into two groups and provided heterogeneously across organizations. Most of these support types do not have the clear-cut categories appearing in business school textbooks, such as finance, accounting, marketing, and so on. Instead, the categories of support provided by support organizations and identified by entrepreneurs were much more diverse and specific. Thus, we point out the important



need for further research on what types of support startups seek, use, and find valuable, and how that compares to what is offered.

The most heterogeneous support was mentoring, which many support organizations identified as their primary service, though the form and content of this mentoring could have varied greatly. We had only limited knowledge about the exact content of mentoring. It could have been about some of the other functions listed in Table 3, such as refining the business model, finding the best-fit talent, managing cash-flow, or balancing work and life. In all cases, individuals mentored nascent entrepreneurs on a purely voluntary basis and did not have monetary incentives for consultation. Rather, the mentors had gone through similar processes in their past and they were willing to give back to the new generation. In that sense, the mentor-based support found here is contextually different from the presence of professional and support services that cluster theory (Porter 1998a) or global city literature (Sassen 2001) identified; it is much more locally based and non-commercially oriented. Accordingly, local “entrepreneurial recycling” can benefit a region not only directly, as an entrepreneur re-invests their own energies and capital to start new firms and fund others, but indirectly as well, as they serve as role models and mentors to the next generation (Dubini 1988; Malecki 1997; Mason and Harrison 2006).

Further research involving mentors directly is needed, as recent research has started to indicate the presence and importance of mentorship (Motoyama et al. 2013). As mentorship is studied, it will be important to collect data at the source (the mentors) because looking to either support organizations or mentored entrepreneurs will fail to give the whole picture. Support organizations do not necessarily perform the mentoring themselves, but introduce mentors to entrepreneurs. Further, entrepreneurs may give biased responses because they may not disclose their most problematic issues to researchers.

Another implication we can draw from our findings is that the presence of multiple organizations providing somewhat similar, overlapping support functions at the regional level helped entrepreneurs to progress through different development stages. Earlier interview quotes revealed that entrepreneurs got financial support from multiple organizations at different times, which helped them to sustain their operation. As such, even within the same function, different support organizations had different niches and training methods and catered to different stages of the entrepreneurial process. For instance, ITEN provided the Mock Angels Program, in which they trained entrepreneurs to present their business ideas to angel investors. That was contextually different from the pitch practice provided by Capital Innovators, whose primary target was venture capitalists and other institutional investors.



We observed that each organization had different assets, even within the same function of training, and intended to use these assets to provide complementary support to companies. At the same time, the emergence of several support organizations in the past few years, while providing many new opportunities in the region, has substantially changed the landscape of entrepreneurship: four out of seven interviewed support organizations initiated since 2011, in addition to the inception of Arch Grants in 2011. Some organizations were thinking that there were unnecessary redundancies across support systems at the time of the interviews. Indeed, there was some debate about merging some organizations to create efficiencies and to simplify the landscape for entrepreneurs. During our four-month interview period in 2013, two support organizations named new executive directors, with strategic intentions to reorganize their missions. This could suggest constant reorganization of support organizations within a region, at least at the nascent stages of an ecosystem. This further indicates that identifying missing types of support may not be sufficient for creating a healthy ecosystem. Injecting a new element will likely create adjustments by other elements and in the way different elements interact. Indeed, the entrepreneurship ecosystem seen in this study appeared to be a self-regulating system, where filling in missing elements seemed to be taking place through a mechanism similar to market evolution at the organizational level, rather than a top-down method imposed by the public sector.

Through interviews, we further observed that entrepreneurs tried different support groups without formally joining their programs. This shows a selective behavior by entrepreneurs, as well as compatibility concerns between a support organization and an entrepreneur. Support organizations may be tempted to recruit entrepreneurs formally to claim an accomplishment and effectiveness of their programs, but being proprietary in this sense may be harmful. The collaborative nature of the support organizations in this study, and its effect on entrepreneurs, suggests that a delicate balance is needed. In order to maintain collaboration, certain conditions should be avoided, such as organizations free riding on one another, or getting help without committing diligence. Constant communications among support organizations seemed to help this aspect. Support organizations were aware of how and how much other organizations had supported their entrepreneurs. Again, the interconnection among support organizations, the second layer of connections, was highly beneficial in this aspect.

## 5.4 University Support

We would like to highlight the specific roles that several universities in St. Louis played, stemming from past research on entrepreneurship ecosystems which has

discussed the role of universities, particularly Feldman's (2001) emphasis on "engaged research universities" as an element of the ecosystem. There has been much debate about the role of the university as the engine of regional economic development (Fritsch 2002; Kitagawa 2004; Lawton Smith 2007). Past studies argued that the influence of the university was larger for high-tech or knowledge-intensive industries. Generally, we found this to be true – for our case, only firms in the pharmaceutical or biotech sectors were actively involved with universities, not firms from other sectors, such as information technology or manufacturing. Moreover, past research has treated "high-tech" sectors as relatively homogeneous, usually including biotech and pharmaceutical, information technology, and other specialized manufacturing such as aerospace and precision machinery (See commonly used high-tech definitions (Saxenian 1999; Milken Institute 2011)). Expanding this debate, we find substantial heterogeneity within the high-tech sectors in this regard, suggesting that it may be beneficial for future research to delineate more specific technology industries.

Second, as discussed in the analysis section, a common pattern we found was that for startups with university connections, the form of this connection was that the founders were students or post-doctoral researchers at universities and applied the technologies they studied to commercial settings. Similar findings have been found for students at MIT (Roberts and Eesley 2011). In this sense, it was not professors or the technology transfer office that made possible the commercialization of university-based technologies. Transfer or commercialization took place through individuals, and not in a way suggested by a standard linear model, such as in the Triple Helix model (Etzkowitiz 2008; Etzkowitiz and Leydesdorff 2000). The creation of patents and licensing were not the observed method for the university to engage with local entrepreneurship, and we did not see scientific knowledge trickle down by itself. Compared to faculty and university staff, students and post-doctoral researchers are more mobile, and they carried and applied their scientific knowledge outside of the university setting.

The Skandalaris Center at Washington University in St. Louis was one of the most active support organizations, but was not a typical college entrepreneurship center. It was a special independent unit that directly reported to the university chancellor, as opposed to being under the business school or related to a technology transfer office. Its endowment came from an entrepreneur, who specifically instructed its executive director to be non-academic. The key function that The Skandalaris Center played was to motivate and prepare students for early-stage entrepreneurship and to connect students with local startup entrepreneurs. It did this by establishing a platform to bounce early business ideas between students, providing student resumes to startups, and allowing

local entrepreneurs to serve on the judging panels for competitions. Thus, the role that this university played in the local system of entrepreneurship was substantially different than only providing a technology transfer office or courses through the business school. In this sense, we saw the university as one of the elements in this ecosystem, because it provided a specific mechanism to create flow between the student population and local startup firms. This type of university involvement is not completely unique to The Skandalaris Center, as a similar case was found at the University of Waterloo (Bramwell and Wolfe 2008). We still find room for more research on this type of university involvement in entrepreneurship, however, as the literature on the Triple Helix or academic entrepreneurship (Corbett, Siegel, and Katz 2014; Link, Siegel, and Wright 2015) has barely covered this dimension.

Lastly, we would like to note that all senior level staff at support organizations had significant experience in the private sector or as entrepreneurs, and none had backgrounds involving traditional economic development agencies. Through our interviews, we found evidence to suggest that the support organization staff could connect entrepreneurs to potential mentors because they had a well-developed network and knew what kind of experiences different potential mentors had gone through. This allowed them to diagnose what kind of specific entrepreneurial challenge each entrepreneur was facing and associate which mentor would be most helpful in that specific context. It was not a simple assignment of mentors based on generic categories, such as industrial sectors or functions of business operation. This leads us to a significant policy implication: For the most successful mentorship of entrepreneurs, it is important for local support organizations to be led by those seasoned in the local system and networks of entrepreneurship. Knowing that potential mentors exist is probably insufficient, and inserting an outside coordinator to find local mentors is unlikely to be useful.

## 6 Concluding Remarks

In this research, we brought a social network perspective to the study of entrepreneurial ecosystems through qualitatively investigating and analyzing the interconnections between and among entrepreneurs and entrepreneurship support organizations. We found that the way in which entrepreneurs interact and form relationships, leading to support, learning, and growth, was substantially influenced by the way support organizations interacted and by the way the support that they offered was structured, both on its own and in relation to other support offered in the region. We reached these findings by asking questions at

the ground-level of observation and from the entrepreneurs' perspective: What kind of inputs or supports did you receive for your business? From whom? In contrast, past ecosystem studies often used the holistic approach posed by urban geographers and economic development scholars: How is the regional entrepreneurship ecosystem structured? What are the regional assets of this area in terms of entrepreneurship? These holistic questions have a valuable place in research, but they cannot answer what constitutes an ecosystem in terms of daily operations and interactions. We believe that our approach of asking about past experiences and concrete examples, from the entrepreneurs' and support organizations' perspectives, helped to identify the tangible connections that make up the ecosystem and the nature of those connections.

Arch Grants employed a rather unusual approach that we believe contributed to many of our findings. They distributed small prizes widely, twenty in 2013 and even more annually in recent years. This was a sharp contrast to most other traditional business plan competitions established by the public sector, which provide a large sum, as much as one million dollars for the first prize, but give out no more than a few prizes. Arch Grants additionally integrated with local entrepreneurship assets, including encouraging its recipients to locate in specific locations. This further enhanced the interaction between the entrepreneurs, and connected them to key local support organizations, such as ITEN, BioGenerator, and others.

It is hard to tell if the Arch Grants model will continue in its current form, or if the supported companies will continue to grow successfully. As of March 2015, almost two years after the selection, most Arch Grants recipients seemed to be thriving: the twenty companies created 205 jobs, generated \$7 million in revenue, and attracted almost \$36 million investment (Arch Grants 2015). It is even harder to tell how the startup ecosystem will evolve and integrate with the broader entrepreneurship ecosystem in St. Louis over the coming years. This is the dilemma that social science researchers with no pure experimental design opportunity have to face. However, we hope that our key findings and proposed framework in this research can provide implications for further investigation of the entrepreneurial ecosystem and associated research methods.

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