KNOWLEDGE SEEKING AND COMMUNICATIVE STRATEGIES FOR EARLY STAGE ENTREPRENEURS

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A dissertation submitted to the

School of Graduate Studies

Rutgers, The State University of New Jersey

In partial fulfillment of the requirements

For the degree of

Doctor of Philosophy

Graduate Program in Communication, Information and Library Studies

Written under the direction of

Dr. Matthew S. Weber

And approved by

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New Brunswick, New Jersey

January 2019

ABSTRACT OF THE DISSERTATION

Knowledge seeking and communicative strategies for early stage entrepreneurs

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While human capital, social capital, and financial capital are considered key resources for entrepreneurs to survive the process of evolution from idea generation to venture growth, it is the knowledge about where to access these resources and how to deploy them that differentiates entrepreneurs' experiences in the early stage of founding an organization. This dissertation examines how entrepreneurs seek knowledge through various multiplex communicative strategies during the nascent and new business stages to overcome the barriers of emergence. Prior research on entrepreneurial knowledge provides insights on the outcomes of entrepreneurs' knowledge-seeking activity, yet few researchers have focused on the specific communicative processes that relate to the acquisition of knowledge.

Drawing on scholarship related to knowledge management, media use, and entrepreneurship, this dissertation includes three components pertaining to early stage entrepreneurs' knowledge-seeking behaviors: knowledge ambiguity management, the influence of prior experience, and mentor selection and engagement. The empirical

context is high tech industries in the New York City metropolitan area, featuring one of the biggest entrepreneurship ecosystems in the world. The mixed-method approach employed integrates insights emerging from observation, thematic analysis of interviews, and quantitative analysis of survey data.

The results generally highlight the significance of media multiplexity in facilitating entrepreneurs' access of knowledge and resources. Entrepreneurs use online and offline communication channels strategically to cope with the knowledge ambiguity arising from their social and business environments, with tactics such as optimizing information relevance, accessing indirect knowledge, and increasing communication efficiency. Prior industry experience may not necessarily enhance an entrepreneur's access of knowledge. The findings also highlight the importance of establishing mentor-mentee relationships in seeking knowledge. Age similarity, ethnic similarity, and trust are key conditions for developing multiplex media ties with mentors. In addition, entrepreneurs rely heavily on peers to facilitate knowledge interpretation. While the traditional concept of mentors emphasizes career guidance, the network brokerage function of a mentor is more relevant in entrepreneurial context.

In summary, the findings of this dissertation generate crucial insights into the understanding of communication strategies used by early stage entrepreneurs in acquiring knowledge and overcoming the liabilities of newness and smallness.

Acknowledgements

First and foremost, I would like to express my deepest gratitude to my advisor, Matthew Weber, for his constant support and encouragement throughout my graduate school life. Matt is a wonderful advisor who cares about my personal development, guides me through all the obstacles, and gives me the freedom to explore. There are not enough words to express my appreciation for his kindness in helping me develop my career path and finish this nearly impossible dissertation.

I am also extremely grateful to my committee members who always believed in me. Craig Scott generously helped me with insightful comments from the first semester of my program to the final version of the dissertation. I greatly admire Craig's humor and optimism. Although I did not have the opportunity to take a course with Marya Doerfel, I enjoyed being her mentee very much. Every meeting with her was a fulfilling learning experience. My sincere gratitude also goes to Jeff Treem, who was willing to be my outside committee member. I have long admired Jeff's research and I am glad to have had the opportunity to learn from him.

I would like to thank all the professors I have worked with in the School of Communication and Information for giving me the opportunities to learn and grow, including Marie Radford, Jen Theiss, Nick Belkin, Katya Ognyanova, and Dan O'Connor. I am grateful to have had Jennifer Gibbs on my qualifying exam committee. Her knowledge of organizational dynamics offered me tremendous insights in the field. Thank you to my cohorts, Allie Kosterich, Eun Rha, Joy Cox, and Teis Kristensen for keeping me motivated and making the best of our time together. Many thanks also go to

my mentors Larry Starr and James Lytle at the University of Pennsylvania for cultivating my initial interests in Organizational Theory and Communication.

This dissertation would not exist without the help from all the entrepreneurs that invested time participating in the research. Their interests in this research have been my source of strength during the most challenging data collection phase. I am grateful for the trust they have in me and their generous sharing of stories and resources.

I would like to thank my family for their unconditional support. My grandparents have had the greatest influence on me since my childhood. I still remember the instant noodles my grandfather shared with me at 2 a.m. when we worked together to prepare for my math exam in high school. I believe my accomplishment is the best gift for his upcoming 90th birthday. Many thanks to my parents for their continuous love and their sharing of my happiness and stress. Thank you to my husband, Mike Hay. He is the person who has always believed in and supported me, not only for my research but my whole life. I am grateful for the time he spent on giving comments on my dissertation. I truly could not have accomplished this without him. Thank you to my best friend Rhino for listening and being there when I needed support. Last but not least, I am grateful for having the companionship from my dog Kipper along the dissertation writing journey.

Table of Contents

List of Tables

List of Figures

Chapter 1

Introduction

Entrepreneurship is central to the way in which economies are able to grow over time. Recent research shows that entrepreneurial organizations contribute to regional growth as a primary source of new jobs (Hathaway, 2016; KritiKoS, 2014). Companies less than one year old have created an average of 1.5 million jobs per year over the past three decades (Wiens & Jackson, 2015). These employment opportunities generate income and ultimately reduce poverty (Jasra, Khan, Hunjra, & Rehman Ur, 2011). Based on the 2018 annual report from the Global Entrepreneurship Monitor (GEM), almost 70% of the working population in 52 economies around the world believe that entrepreneurs enjoy high status within their societies and 62% of the working population in North America see good opportunities for starting a business (Global Entrepreneurship Monitor, 2018). Overall, entrepreneurship has attracted increasing public interest as a well-regarded career option with promising opportunities.

However, the early stages of forming a commercially-viable company present entrepreneur with numerous challenges. At least half of new ventures failed within five years (Huang & Knight, 2017). Compared to more mature organizations, entrepreneurial organizations must shoulder significant liabilities of newness and smallness that threaten their survival and growth (Aldrich, 1999; Stinchcombe & March, 1965). Entrepreneurs must also address change and unpredictability in their environments, such as evolving consumer preferences and the unpredictable behavior of competitors (von Gelderen, Frese, & Thurik, 2000). Entrepreneurial organizations are most fragile at the beginning of

their lifecycle and increase viability over time (Sapienza, Autio, George, & Zahra, 2006). A 2014 survey of 1242 entrepreneurs showed that unpredictability of overall business conditions (46%) was the most cited challenge facing early stage entrepreneurs (Kauffman Foundation, 2015). Many of these challenges arise from early stage entrepreneurs' limited access to information.

Communication Behaviors of Entrepreneurs

The significance and consequences of communication have been widely discussed in the entrepreneurship literature. Successful entrepreneurs have the responsibility to manage the internal operation of the emerging business, and also have to develop external networks (Lee & Tsang, 2001). Communication is central in this process; entrepreneurial opportunities have been shown to "evolve through active interaction with different network contacts" (Ardichvili, Cardozo, & Ray, 2003; Sölvell & Larsson, 2006, p. 338). During the initial idea generation period, entrepreneurs benefit from external advising such as mentorship to validate their business concepts and prioritize among many possible actions (Chrisman & McMullan, 2000; Frederic Delmar & Shane, 2002). Moreover, startup development rarely proceeds according to plan; the process involves change and adaptation (Klofsten, 2003). Entrepreneurs learn to develop knowledge, adjust strategies, and make decisions with the input from external supporters (Sölvell & Larsson, 2006). At each stage of development, entrepreneurs rely on communication to initiate and develop social networks.

External communication plays a critical role in the development of entrepreneurial organizations. Entrepreneurs of successful organizations tend to spend more time communicating with their stakeholders than those of unsuccessful

organizations (Duchesneau & Gartner, 1990). Entrepreneurs employ various communicative tactics to organize resources and influence their external environment (Aldrich & Fiol, 1994; Lounsbury & Glynn, 2001). These communication activities play a critical role in helping entrepreneurs build legitimacy (Deeds, Mang, & Frandsen, 2004; Zimmerman & Zeitz, 2002), acquire resources (Smith, Smith, & Shaw, 2017) and establish their sense of identity (Warren, 2004). An analysis of entrepreneurs' participation in industry events shows that social interactions in different events were more likely to help entrepreneurs coordinate resources (Stam, 2010). Smith et al. (2017) indicated that different social media channels make varying contributions to entrepreneurs' social capital. A discursive approach also suggests that entrepreneurial identity is relational and emergent, developed through communication with family, customers, competitors, mentors and others (Rigg & O'Dwyer, 2012). Based on this approach, entrepreneurial identity progresses through the notion of becoming, through and in relation to others.

Although external communication is widely-acknowledged as a key activity for entrepreneurs seeking to develop their networks to access resources, research to date has taken a coarse-grained view of communication, merely registering the frequency of information exchange or the time spent communicating (Huggins & Johnston, 2010; Shepherd & Zacharakis, 2001; Witt, 2004). To that end, extant research on communication and entrepreneurship devotes less time to discussion of the media through which entrepreneurial communication and relationship maintenance are enacted (Ledbetter, 2010), as well as the fact that communication often occurs across multiple channels, sometimes simultaneously. The role of multiplex communicative ties in

external networks remains a relatively understudied area of research (Haythornthwaite, 2001; Selg, 2015). Indeed, prior work often glosses over the nuanced mechanisms by which communicative interactions impact entrepreneurial activity.

Entrepreneurial Knowledge-Seeking

Communication is central not only to the concept of network relationships with external stakeholders, but also to the concept of knowledge. Knowledge is the foundation for an entrepreneurial organization's early survival and longer-term sustainability (West & Noel, 2009). The rise of the knowledge economy created an explosion of entrepreneurial activity and new firm formation (Acs, Carlsson, & Karlsson, 1999). Acquiring external knowledge is closely related to the meaningfulness and novelty of new products (Kim, Im, & Slater, 2013) and the search of potential new market openings (Gaglio & Katz, 2001). Fledgling organizations that can mobilize the tacit knowledge embedded in their social relations enjoy a substantial advantage over competitors (Stuart & Sorenson, 2005). To that end, knowledge management has received a great deal of interest in recent entrepreneurship literature as scholars focus on ways in which entrepreneurs manage knowledge, such as generating, accessing, sharing, and exploiting knowledge to create competitive advantages (McAdam & McAdam, 2006; McKelvie, Wiklund, & Brattström, 2018; Smith, Collins, & Clark, 2005). Prior research provides comparatively rich insight into the enablers and consequences of knowledge-seeking.

The use of communication in seeking knowledge remains relatively understudied. Limited empirical research has been conducted about the process of searching knowledge, which is often regarded as the first critical steps in the entrepreneurial process (Shane & Venkataraman, 2000). In particular, little work has focused on how

knowledge-seeking is communicatively achieved as well as how entrepreneurs' background affects their experiences. Entrepreneurs' previous experiences influence their abilities to comprehend, extrapolate, interpret, and apply new information (Heil & Robertson, 1991). While some explanations of how entrepreneurs' backgrounds affect communication behaviors have been identified (Lee & Tsang, 2001), findings are generally fragmented and inconclusive.

Multiple theories and empirical studies have suggested the potential impact of prior experience on present entrepreneurial behaviors. For example, based on the theory of bounded rationality, less-experienced entrepreneurs need to cope with limited conceptualizations of problems so that their knowledge-seeking processes aim to satisfy rather than optimize (Cooper, Folta, & Woo, 1995). Also, building on the idea that building ties with unfamiliar others in unfamiliar contexts requires certain social skills and credentials (Baron & Markman, 2003), Stam (2010) found that entrepreneurs' prior experience correlates with their willingness and social competence to initiate new ties at events. In contrast, the concept of bricolage implies that more experienced entrepreneurs are more likely to concentrate on exploiting the available knowledge at hand rather than seeking out new knowledge (Baker & Nelson, 2005). Prior experience has also been viewed as a stumbling block inhibiting entrepreneur's awareness of alternatives (Reuber & Fischer, 1999). However, prior studies either did not explicitly examine the different dimensions of prior experience on communication behaviors or they did not take into account the dimensions of knowledge itself in influencing the knowledge-seeking process.

Entrepreneurial Mentoring

While funding remains one of the biggest barriers for early stage entrepreneurs, the necessary financial support is not in itself sufficient to enable them to fulfill their potential. A study for the G20 Young Entrepreneurs' Alliance Summit shows that there is a pressing need to provide these emerging businesses with a broader support ecosystem, including mentors, incubators, startup programs, entrepreneurs' associations to help facilitate the sharing of knowledge (Ernst & Young, 2013). The GEM Survey indicates that it is particularly important for the policymakers and employees in other business sectors to create opportunities for networks that can assist in the mentoring of young entrepreneurs and women entrepreneurs (Global Entrepreneurship Monitor, 2017). Many governments have introduced programs to support entrepreneurs. For example, the Canadian Youth Business Foundations provides high-potential entrepreneur between the ages of 18-34 access to a personal mentor for a minimum of two years in addition to CAD 150,000 funding (Goverment of Canada, 2010). The provision of mentorship programs is particularly useful for young entrepreneurs who have limited work experience.

Many scholars recognize the importance of mentorship in the entrepreneurial context (Haggard, Dougherty, Turban, & Wilbanks, 2011; Ozgen & Baron, 2007). Mentorship is a process that is primarily associated with transmitting knowledge (Roberts, 2000). Through developing mentorship relationships, early stage entrepreneurs may benefit from cognitive learning (new knowledge and opportunity recognition), affective learning (improved self-efficacy), new connections, and even increased profitability (Bisk, 2002; St-Jean & Audet, 2008). Most prior research on entrepreneurial

mentorship focuses on articulating mentors' impacts on early stage entrepreneurs' personal development and organizational growth (Spigel, 2017b; St-Jean & Audet, 2012). In order to attract the attention of a mentor, entrepreneurs must be able to sustain and nurture interpersonal relationships and demonstrate their potential for achievement (Fagenson, 1989). Yet, there is a dearth of attention to the ways in which early stage entrepreneurs exchange knowledge and maintain relationships with mentors.

Communication between early stage entrepreneurs and mentors may occur in a variety of forms, such as face-to-face, email, video chat, instant messaging, and social networking sites. The use of different communication forms may facilitate the transfer of context-specific information and enhance the effectiveness of knowledge-seeking (Lind & Zmud, 1995). Media choice is one significant factor influencing the formation of individual social networks and the knowledge-sharing processes in organizations (Gibbs, Rozaidi, & Eisenberg, 2013; Kim, Kim, Park, & Rice, 2007). However, despite extensive work on mentor-entrepreneur relations, little research has focused on identifying the determinants of entrepreneurs' media choices and how those media choice affects the processes and outcomes that entrepreneurs experience or achieve. There have been few attempts to detail how entrepreneurs maintain relationships with mentors through a variety of channels. Likewise, few have detailed how entrepreneurs navigate multiplex channels based on social relationships, personal characteristics and motives, as well as contextual factors.

Research Focus

The first goal of this dissertation is to explore the sources of knowledge ambiguity during early-stage of organization founding and the way early stage entrepreneurs cope with such ambiguity and uncertainty. In this way, this dissertation focuses specifically on entrepreneurs' network engagement and media use as two dimensions in analyzing how they interpret and access knowledge. Second, this study explores whether the breadth and relatedness of entrepreneurs' prior experience will lead to different levels of knowledge access. This section focuses on interactions within the knowledge-intensive industries in which entrepreneurs are expected to use superior knowledge and judgement to create value. In addition, this study examines the association between media use, knowledge network engagement and knowledge access. The influence of knowledge explicitness on entrepreneurs' knowledge-seeking process is also included in the analysis. Third, this study extends the literature by exploring the outcomes and antecedents of media multiplexity between entrepreneurs and their mentors. While media multiplexity has long been related to tie strength, this study examines this association in entrepreneurial context to explore how media use affects knowledge acquisition.

Significance of the Study

The overarching goal of this dissertation is to better understand knowledge-seeking behaviors among early-stage entrepreneurs by examining how they interpret and leverage information as well as how they identify and interact with knowledge sources. In reviewing prior literature, three limitations emerged at the intersection of entrepreneurship and communication. First, the significance of how entrepreneurs seek knowledge and what they do to enhance their knowledge-seeking experience is a

neglected area of study in entrepreneurial behavior. Second, there is limited understanding of how entrepreneurs' prior experiences complicate the knowledge-seeking process. Third, despite the growing interest in using communication as a variable for measuring the occurrence of interaction, there is little empirical research into the actual communication processes of acquiring knowledge, and how participation in these communicative activities relates to knowledge access.

The three limitations in the prior literature are further discussed below. First, compared to the role of financial capital, entrepreneurial knowledge has not been given sufficient attention in regard to its influences on the whole life-cycle of entrepreneurial organization. Human capital, social capital, and financial capital are the three main types of entrepreneurial resources (Florin, Lubatkin, & Schulze, 2003) acknowledged by scholars across social science disciplines, from economics (Glaeser, Laibson, & Sacerdote, 2002) to sociology (Burt, 1992). In addition, Clough, Pan Fang, Vissa, & Wu, (2018) include legitimacy (Frédéric Delmar & Shane, 2004), patents (Hsu & Ziedonis, 2013), and narratives (Martens, Jennings, & Jennings, 2007) as alternative forms of entrepreneurial resources. Among these entrepreneurial resources, venture capital (VC) financing has been used as the most crucial outcome variable usually explained by human capital (e.g. entrepreneurs' education background) and social capital (e.g. network composition). Scholars question the validity of focusing predominantly on financial outcomes, as such a focus is often due to the ease of access of secondary data on VC funding and the fact that VC funding has been the center of media coverage (Clough et al., 2018; Ruef, 2006). There is limited attention for how entrepreneurs search for and access alternative resources such as knowledge.

Second, there is limited understanding of how the entrepreneur searches for resources in the first place, even though much work has focused how entrepreneurs are granted access to resources (Clough et al., 2018). The assumption that knowledge search is not important for entrepreneurs is based on two factors: first, entrepreneurs are not afforded to focus on choosing the best-fit knowledge holder at early stage, and second, it is relatively difficult to observe or measure the way entrepreneurs engage in the search process (Clough et al., 2018). Among the three steps of process mechanism, namely search, access, and transfer of resources, this dissertation examines search and access behaviors. The focus is on how entrepreneurs' attributes and cognitions shape their actions, how their actions interact with environmental conditions, and how these responses together influence the effectiveness of their knowledge-seeking.

Third, the ways in which entrepreneurs communicate to identify relevant knowledge sources and signal intention for knowledge transfer are not well-documented. While knowledge-seeking has been extensively reviewed in the communication literature, the context is mostly within organizational structures, which inherently facilitate the awareness and retrieval of knowledge. In the entrepreneurial context, however, understanding of how individuals, who in most occasions function as organizations, seek knowledge and engage with their knowledge sources is limited. Communication is the key resource in facilitating the exchange and coordination between actors (Cooper, Hamel, & Connaughton, 2012). In this framing, entrepreneurs are agents who actively shape their environment through different communication and collaboration strategies (Engel, Kaandorp, & Elfring, 2017). Taking a communicative view of entrepreneurial knowledge-seeking echoes calls to examine entrepreneurship as a process and focus on

what the entrepreneur does to identify opportunities and acquire resources, not who the entrepreneur is (Baron & Henry, 2011; Gartner, 1985). Overall, a focus on communication in obtaining knowledge in entrepreneurial processes will shed light on how entrepreneurs navigate a nascent and uncertain environment.

Organization of the Dissertation

Chapter 1 has offered an overview of the background of the dissertation and points out the significance of the research questions. The following sections of this dissertation are organized as follows. Chapters 2, 3, and 4 review the relevant literature relating to entrepreneurial knowledge, communication behaviors, and mentorship. These three chapters introduce the theoretical frameworks for this study and highlights the literature on specific tensions in explaining the knowledge-seeking phenomenon among entrepreneurs. Building on prior work, research questions and hypotheses are proposed. Chapter 5 illustrates the empirical context of the research and presents the details of the data and methods. Research design, sampling methodology, data collection procedures and analysis procedures are discussed. Next, chapters 6, 7, and 8 present the results corresponding to the research questions listed in chapters 2, 3, and 4. Chapter 6 offers insight into the way early stage entrepreneurs pursue knowledge, specifically how they navigate an uncertain environment through interacting with media channels and social networks. Chapter 7 presents the impact of prior experience and knowledge explicitness on entrepreneurs' media use, network engagement and knowledge access. Chapter 8 provides an integrated and interacting view of the formation and maintenance of entrepreneur-mentor relationship. Chapter 9 concludes with a discussion summarizing the research findings, implications, and limitations as well as future research directions.

Chapter 2

Knowledge Ambiguity

This chapter details the factors leading to knowledge ambiguity alongside the coping strategies baked into early stage entrepreneurs' communication. The definition of early entrepreneur is introduced, followed by an extensive literature review on the key concepts of organizational knowledge and entrepreneurial knowledge. Understanding the priorities and constraints of emerging organizations aids in the understanding of entrepreneurs' motivations in knowledge-seeking.

Entrepreneurship – the process of developing a new organization – generally connotes a meaning of earliness and uncertainty. The life cycle of entrepreneurial organizations is a useful framework for defining entrepreneurial activity and understanding the organization creation process (Grossman, Yli-Renko, & Janakiraman, 2012; Memon, Rozan, Ismail, Uddin, & Daud, 2015). In the entrepreneurship literature, organizations are seen as progressing through emergence, early growth, later growth, maturity, and often death (Hite & Hesterly, 2001). This dissertation adopts GEM's operational definitions of entrepreneurial process of early-stage phases.

GEM collects primary data on a global basis annually and its entrepreneurship indicators have been widely used by the United Nations, World Bank, and Organization for Economic Co-operation and Development (OECD). There are four phases — nascent, new business, established business, and discontinuation — associated with new venture evolution (Global Entrepreneurship Monitor, 2018). As a matter of definition, this dissertation regards an emerging organization as an organization-in-creation, comprised of a nascent (pre-organizational) stage and a new business stage.

Nascent Business Stage

Katz and Gartner (1988) indicate that the problem with most organizational lifecycle theories is that the researchers only focus on the stages after the organization has come into existence. There has been a latter-day recognition of the significance of the stage preceding the legal establishment of the organization (Hite & Hesterly, 2001). In this approach, the investigation of entrepreneurship is not just on new venture creation, but also on the entire creation process, since nascent entrepreneurs began to communicate their intentions to start a business, regardless whether they get to the founding stage (Kessler & Frank, 2009). It is the 'seeking' process that sustains the emergence of new organizations.

This nascent stage has been further divided into two phases: the idea, or conception phase and the pre-startup phase. The conception phase is the time when entrepreneurs identify an unaddressed market need and start securing funding to create new solutions. Entrepreneurs then use the initial funding to test their ideas by developing prototypes and collecting feedback (Clarysse & Bruneel, 2007). In the pre-startup phase, with a product in hand, the entrepreneur decides to build an organization and starts searching for resources (Clarysse & Moray, 2004). The time spent in this stage is largely industry-determined (Roberts & Dowling, 2002). For example, biotechnology startups tend to spend more time in conception phase than internet-based startups for testing solutions (Memon et al., 2015). These two phases together – new business and nascent – mark a critical period determining the future direction of an emerging organization.

As shown in Figure 1, early-stage entrepreneurial activity refers to the four-stage process from conception to organization growth (or discontinuation). Compared to those

organizations already in the process of creation, nascent organizations usually do not have clearly-defined goals, available resources, boundary-identifying conditions and ongoing exchange (Grossman et al., 2012; Katz & Gartner, 1988). Examining organizations at the nascent stage allows scholars to explore entrepreneurs' behaviors at a time of high organizational ambiguity (Grossman et al., 2012). In addition, this is a stage when entrepreneurs are known to be involved in high network dynamism, actively meeting and interacting with those individuals who might emerge as future resource providers (Greve & Salaff, 2003). Moreover, nascence connotes a state in which entrepreneurs face a lack of awareness by outsiders, which increases the difficulty of acquiring essential resources (Mitteness, Baucus, & Norton Jr, 2013). In general, emerging organizations need to overcome the disadvantages of having limited external resources and the lack of structures to support daily operation.

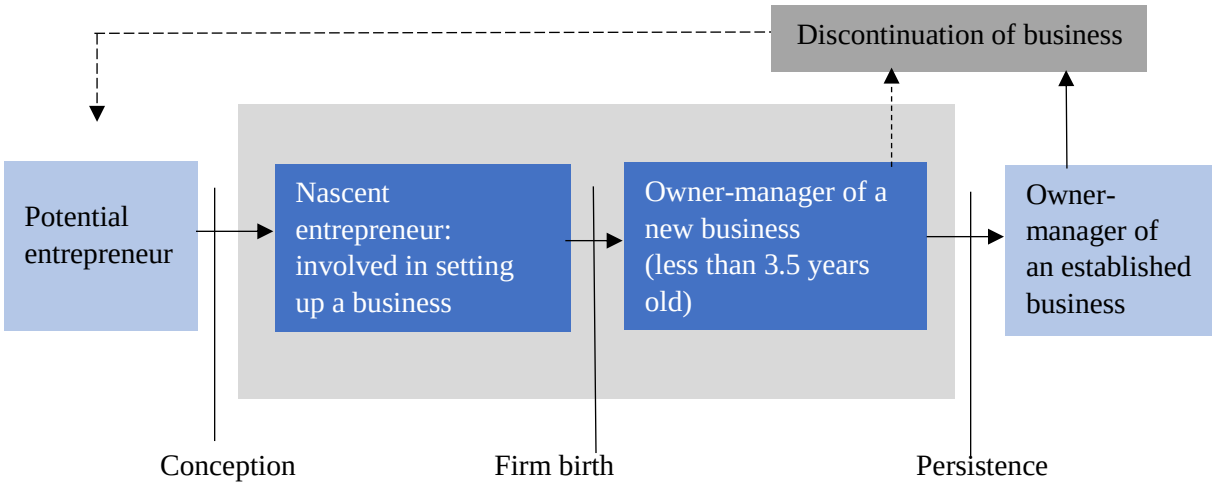


Figure 1. Total Early-stage Entrepreneurial Activity (TEA). Adapted From 2017/2018 Global Entrepreneurship Monitor Report, January 2018. Retrieved from https://www.gemconsortium.org/report/50012

New Business Stage

The new business stage includes two phases — the survival phase and the early growth phase (Memon et al., 2015). During the survival phase, entrepreneurs have established the organization and brought the product to the market. It is particularly challenging for these organizations to generate enough income to sustain daily operation and increase market acceptability (Sullivan, 2000). Increasing efficiency is key in ensuring stable organizational growth (McGowan, 2012). In the early growth phase, the entrepreneur starts building a team and the entrepreneurial organization exhibits initial stableness.

In the process of creating something new and different, early stage entrepreneurs need to acquire and assemble the resources for its exploration and exploitation. Scholars have identified four properties of new organizations: intentionality, resources, boundaries, and exchange (McKelvey, 1982). Intentionality describes the common belief structures regarding the goals, purposes, history and methods that sustain the organization (Katz & Gartner, 1988; Van de Ven & Ferry, 1980). Resources refer to the physical components that form the foundation of an organization, such as human capital, financial capital, property and credit (Hannan & Freeman, 1977). Boundaries capture the idea that the new organization possesses some of the resources within the boundary, namely, company name, address, licenses, etc. that form the premise for cross-boundary exchange (Kilby, 1971). Finally, organizations also benefit from ongoing transactions and exchanges with various internal and external entities. In general, these four properties capture the components that sustain the operation of a new organization.

Early Stage Entrepreneur

The owners of organizations in the nascent or new business stages are called "early stage entrepreneurs." Within uncertain environments of emergence, early stage entrepreneurs must "initiate resource management in the absence of resources" (Grossman et al., 2012, p. 1764). When it comes to network research, many prior studies selected the organization rather than the owner as the unit of analysis because they believed that the overlapping networks of owners and staff will provide more insights for organizational level research (Shaw, 2006). However, entrepreneurial activity here is referring to personal behavior. This dissertation focuses on how early stage entrepreneurs develop knowledge networks given that an organization's initial network ties tend to originate with the founders or co-founders (Baker, Miner, & Eesley, 2003; Grossman et al., 2012). These entrepreneurial networks are "genuinely personal, integrating business concerns and social commitments in individual ties" (Johannissson, 1998, p. 300). In addition, the internal knowledge capacity of emerging organizations is mostly shaped by the founders' assembly of knowledge. Hence, this work seeks to understand the influence of individual communication behaviors on their own knowledge-seeking processes rather than the interactions within a startup team.

Knowledge–Intensive Industry

The focus of this dissertation is on knowledge–intensive industries. Different business sectors operate in their own institutional contexts, which encompass formal structures as well as informal conventions (De Clercq, Lim, & Oh, 2013). Thus, the communication behaviors of early stage entrepreneurs are both constrained and enabled by the specific institutional context associated with the business sector (DiMaggio &

Powell, 1991; Meyer & Rowan, 1977). The emerging organizations in this dissertation are located in knowledge-intensive sectors, which constitute an area of increasing theoretical interest in entrepreneurial studies (Frédéric Delmar & Wennberg, 2010). Organizations in knowledge-intensive sectors are more intensive in their inputs of technology or human capital than other sectors.

Knowledge-intensive business service consists of "private companies or organizations who rely heavily on professional knowledge, i.e. knowledge or expertise related to a specific (technical) discipline or (technical) functional-domain to supply intermediate products and services that are knowledge based (Hertog, 2000, p. 505)." There are three key assumptions implied in this definition (Muller & Doloreux, 2007). First, the services or products offered by knowledge-intensive companies are for business use, not for private consumption (Strambach, 2001). Second, the concept of "knowledge-intensive" could be understood as in terms of labor requirements (Miles, 2005) or the conditions of exchange between producer and user (Hauknes, 1998). Third, knowledge-intensive work demands complex intellectual input for decision-making and operations (Alvesson 1995). Overall, knowledge-intensive industries are business-oriented sectors that have a high demand for human capital and require ongoing development of new human capital.

Knowledge-intensive organizations either produce technology as an end product or use technology in the production process. For instance, information and communication technology (ICT), media, professional services, and finance and insurance are viewed as highly digitized industries across dimensions in assets, usage and labor (Dutta, Geiger, & Lanvin, 2015). Also, unlike capital-intensive or labor-intensive

organizations, knowledge-intensive organizations draw upon the application of superior knowledge and judgement to create value (Kärreman, 2010; Starbuck, 1992). Entrepreneurs are expected to possess specialized skills for launching a business in the knowledge-intensive sector (Kim, Lee, & Reynolds, 2012). Compared to other sectors, high-tech industries often have higher entry barriers and require more startup costs.

Knowledge in Organization

Knowledge is a foundation of an organization's competitive advantage, sustainability, and long-term success (Bock, Zmud, Kim, & Lee, 2005). The significance of organizational knowledge is attributed to fast-growing globalized economies and the advancement of information and communication technologies (Alavi & Leidner, 2001). While some researchers use the terms knowledge and information interchangeably (Bartol & Srivastava, 2002), herein knowledge is defined as the accumulated body of information gained from experiences and based on context, which can be used to inform actions (Davenport & Prusak, 1998). Information is a combination of data that an individual can use to solve problems (Child & Shumate, 2007). The availability of information helps individuals develop "corridors" of knowledge (Ronstadt, 1988). Information, coupled with knowledge, influences potential entrepreneurs' attitude formation in new venture creation (Ajzen, 1991) and their skills in tackling startup challenges (Blair & Marcum, 2015). Although both terms are used in this dissertation, "knowledge" refers to a more refined version of "information," incorporating entrepreneurs' personal interpretations.

Knowledge transfer. Organizations achieve better performance through the sharing and transferring of knowledge among employees. Communication scholars study

knowledge mostly in the organizational setting, focusing primarily on "how distributed group members and their organizational colleagues locate, store, and retrieve the knowledge that they need for their individual and collective work" (Hollingshead, Fulk, & Monge, 2002, p. 335). Knowledge-sharing refers to the process of exchanging task information and know-how to enable idea generation and problem solving (Hansen, 1999; S. Wang & Noe, 2010). During this process, individuals interpret knowledge to co-create meanings (Ellison, Gibbs, & Weber, 2015). In practice, knowledge-sharing may involve verbal communication about a given task, the exchange of tangible resources, or implicit coordination of expertise (Cummings, 2004). As a matter of definition, 'knowledge transfer' subsumes knowledge-sharing, which does not explicitly involve the acquisition of knowledge by the recipient (Cabrera, Collins, & Salgado, 2006; Szulanski, Cappetta, & Jensen, 2004). Knowledge transfer can only occur when both knowledge-seeking and knowledge-sharing exist.

There are numerous variables that complicate knowledge transfer in organizational settings. Scholars have emphasized the significance of socio-cognitive factors, such as incentives, trust, and relationships in influencing knowledge-sharing (Chow & Chan, 2008). Employees' lack of willingness or ability to share is often cited as a key inhibitor to knowledge-sharing (Hansen, 1999). Complexity of knowledge may additionally diminish ability of organizational members to transfer knowledge. When knowledge is dependent on other information, or is difficult to document, additional communicative efforts will be required to coordinate knowledge-sharing. Competition between team members may further restrict employees' willingness to share knowledge with another.

The network perspective of knowledge argues that organizational knowledge resides not in particular individuals, but in the network as a whole (Contractor, 2002). The explosion of the internet and proliferation of ICT technology motivates the concept of "organization as networks" (Hartman, Sifonis, & Kador, 2000). It is not only the individuals that communicate knowledge, but also individuals in aggregate, such as those in groups, departments, and organizations, as well as nonhuman agents e.g. knowledge repositories (Contractor & Monge, 2002). Because the sources of knowledge are often distributed and amorphic, the significance of knowledge-seeking sometimes overrides that of knowledge contribution in the entrepreneurial context.

However, most research on knowledge-sharing has focused solely on the motivations and behaviors associated with knowledge contribution, because it is more complicated than knowledge-seeking (Bock et al., 2005; Orlikowski, 1995; Wang & Hou, 2015; Wasko & Faraj, 2000). As a result, it is unclear "how knowledge-seeking can be encouraged, and how barriers to knowledge-seeking can be overcome" (Bock, Kankanhalli, & Sharma, 2006, p. 358; Markus, 2001). Among the more recent work on knowledge-seeking, many have focused on exploring the use of knowledge management systems within organizations such as electronic knowledge repositories (Kankanhalli, Tan, & Wei, 2005), and electronic expertise directories (Nevo & Wand, 2005), which store codified knowledge for future reuse. While extensive attention has given to knowledge-seeking within organization, there is a pressing need to study knowledge-seeking behaviors in inter-organizational settings.

The Challenges of Entrepreneurial Knowledge

Compared to other types of organizational knowledge, entrepreneurial knowledge is particularly abstract and experience-based. Following Kirzner (1979), this dissertation defines entrepreneurial knowledge as "an abstract type of knowledge— the knowledge of where to obtain [a] resource and of how to deploy it" (p.8). This entrepreneurial knowledge signals a heightened awareness of information, which enables entrepreneurs to "be sensitive to information about objects, incidents, and patterns of behaviors in the environment, with special sensitivity to maker and user problems, unmet needs and interests, and novel combinations of resources" (Ardichvili & Cardozo, 2000; Ray & Cardozo, 1995, p. 10). Such experience-based knowledge influences entrepreneurs' perceptions of their idea's desirability and feasibility, as well as their own propensity to act (Kuehn, 2008; Schenkel, D'Souza, Cornwall, & Matthews, 2015; Shane & Venkataraman, 2000). Entrepreneurs' education and industry experience can be important sources of knowledge (Shane & Venkataraman, 2000), while at other times knowledge can result from interacting with more-experienced individuals and learning from their stories (Cope, 2005). Overall, entrepreneurial knowledge is an integration of entrepreneurs' past experiences that inform the discovery of opportunity and resource acquisition.

Prior entrepreneurship literature has offered two widely-accepted streams of how to understand entrepreneurial activities. In the Schumpeterian view, entrepreneurs are innovators who introduce new products or processes to create new industries and thereby precipitates structural change in the economy (Schumpeter, 2000). In an alternative view of entrepreneurship, Kirzner (1973) asserts that entrepreneurs are arbitrageurs who

capitalize on knowledge asymmetries in the marketplace to achieve competitive advantage. Hence, entrepreneurial knowledge includes two types of knowledge: technical solutions that either materialize as new products or are used in production of goods and services (technological knowledge), as well as experience-based knowledge about concepts, markets, and organizations (business knowledge) (Karlsson & Johansson, 2006).

New technological knowledge is often complicated and business knowledge is largely tacit knowledge that is often only accessible vis a vis or embedded within inter-firm innovation networks (Bonache & Brewster, 2001; Ellison, Gibbs, & Weber, 2015; Karlsson & Johansson, 2006). Integrating both perspectives, this dissertation asserts that both the generation of technological knowledge and the mobilization of business knowledge constitute the main entrepreneurial activities in early-stage of organization development.

Many definitions are used in the literature to describe the types of knowledge affecting entrepreneurial organizations. Despite the distinction between technical knowledge and business knowledge, this dissertation adapts the ‘determinants’ of entrepreneurial performance in OECD framework to further categorize the access of entrepreneurial knowledge. The OECD framework for entrepreneurship indicators (see Figure 2) illustrates that ‘determinants,’ ‘performance,’ and ‘impacts’ are three inter-connected flows of entrepreneurship (Ahmad & Hoffmann, 2008). Impacts reflect the ultimate ‘value’ generated by entrepreneurs such as job creation, economic growth, innovation, and internationalization. Performance includes indicators that influence impacts, for example survival rate. Determinants are the factors that affect performance,

mainly a combination of opportunities, skilled people and resources. Although OCED framework was developed for informing policy makers about the formulation and assessment of policy measures, its categorization offers valuable insights for the present study on entrepreneurial knowledge.

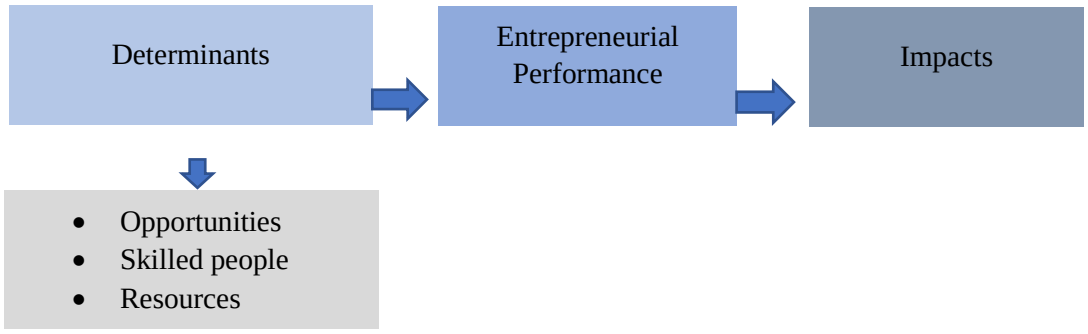


Figure 2. The OCED Framework for Entrepreneurship Indicators. Adapted from A Framework for Addressing and Measuring Entrepreneurship, by Ahmad & Hoffman, November 2007. Retrieved from: https://www.oecd.org/industry/business-stats/39629644.pdf

Opportunities are knowledge about the market conditions, which include competition in the markets, access to foreign markets, procurement regulation, and so on. Skilled people in entrepreneurial context refers to the capabilities of the entrepreneur (human capital) and his or her access to other skills within the entrepreneurial infrastructure (social capital) (Lee, 2000). This dissertation frames the entrepreneur's capabilities as 'management practices' and summarizes access to other expertise as 'hiring and partnership.' Resources signals access to capital as well as R&D and technology. Knowledge about access to capital includes how to access debt financing, business angels, venture capital, other equity, and stock markets. Knowledge on R&D and technology helps turn ideas into new products and processes and it relate to R&D investment, university collaboration, technological cooperation between firms, patent system, etc.

In addition to the five areas of entrepreneurial knowledge mentioned above, career-related knowledge is also included as an indicator of cognitive resources. Career-related knowledge affects entrepreneurs' attitudes toward income, independence, risk and work effort, which in turn influence their intentions in starting new businesses (Douglas & Shepherd, 2002). Moreover, career-related knowledge also relates to the development of self-efficacy (Pihie & Akmaliah, 2009), which refers to a person's belief in his or her capability to perform a given task. Self-efficacy is formed based on individual's assessment of the availability of resources and constraints that might influence the outcome of behaviors (Ajzen, 1987). It plays a role in the development of intentions and it affects the perception of whether a certain goal is attainable (Boyd & Vozikis, 1994). "People who think they can perform well on a task do better than those who think they will fail" (Gist & Mitchell, 1992, p. 183). Recently, self-efficacy has been elevated as an important factor in the entrepreneurial process and opportunity exploitation (Sarasvathy, Kumar, York, & Bhagavatula, 2014). Entrepreneurs' beliefs about their capability for succeeding and tackling challenging goals influence the development of entrepreneurial intentions and behaviors, as well as the complex process of new venture creation (Boyd & Vozikis, 1994). Therefore, entrepreneurial knowledge discussed in this dissertation is a combination of six factors (see Figure 3).

Figure 3. Framework of Entrepreneurial Knowledge

Knowledge Ambiguity. Prior research on entrepreneurial knowledge generally falls into two categories. One highlights the significance of knowledge transfer in the achievement of desirable entrepreneurial outcomes, such as product innovativeness (McKelvie et al., 2018) or startup size (Sullivan & Marvel, 2011a). The other emphasizes the factors that lead to different degree of knowledge transfer effectiveness, such as geographical proximity (Bell & Zaheer, 2007), tie strength between knowledge seeker and knowledge source (Elfring & Hulsink, 2007), and the influence of the entrepreneurial ecosystem (McAdam & McAdam, 2006). Yet, very little work has focused on how entrepreneurs perceive their knowledge-seeking processes and how they cope with knowledge ambiguity.

Knowledge transfer is contingent upon how easily the knowledge could be mobilized, interpreted, and absorbed (Hamel, Doz, & Prahalad, 1989). Kogut and Zander (1992) point to the concept of 'inertness of knowledge,' emphasizing that the ambiguous nature of knowledge, its resistance to clear articulation, its stickiness to the context, and its idiosyncrasy. Knowledge ambiguity refers to "the inherent and irreducible uncertainty as to precisely what the underlying knowledge components and sources are and how they interact" (Van Wijk, Jansen, & Lyles, 2008, p. 833). Knowledge ambiguity has been included as a key construct in several theoretical frameworks such as knowledge-based view of firms, organizational learning, and the dynamic capabilities of firms (King, 2007). Knowledge ambiguity can be understood as a barrier for effective knowledge transfer or implemented as a strategy to maintain competitive advantage by obfuscating the actual goals of the organization.

Multiple factors can impede knowledge ambiguity and transferability. For example, Zander and Kogut (1995) differentiated knowledge along the following dimensions: tacit-explicit, complex-simple, independent-integral, observable-not observable, articulated-not articulated, and teachable-not teachable. Other factors influencing knowledge ambiguity include lack of motivation, absorptive capacity, reliability of the source, and organizational context (Szulanski, 1996). For example, unfamiliarity with a colleague might demotivate knowledge sharing (Hollingshead et al., 2002), intention to maintain power might lead to withholding of critical knowledge (Brown & Duguid, 2001), unawareness of expertise might result in inefficient knowledge seeking (Zack & McKenney, 1995), or the complexity of knowledge itself might impede successful transfer (Kogut & Zander, 1992). For these reasons, the stickiness of knowledge necessitating the design of organizational environment which encourage knowledge sharing behaviors and facilitate the storage and location of knowledge.

In strategic management, knowledge ambiguity inherent in the creation of productive processes creates a strong barrier to imitation so that company can avoid disclosing key information to competitors (Reed & DeFillippi, 1990). While tacit knowledge is often interpreted as more ambiguous than explicit knowledge, management studies further theorize the specific dimensions of ambiguity. There are two main dimensions of ambiguity: component ambiguity and causal ambiguity. Component ambiguity suggests the uncertain nature of the knowledge components and sources (Van Wijk et al., 2008). Causal ambiguity refers to the uncertainty on how those components interact and what are the reasons that lead to different results (Law, 2014). Causal ambiguity leads to a lack of understanding of the logical connections between actions and

outcomes (Lippman & Rumelt, 1982), thus effectively help company achieve sustainable competitive advantages.

Component ambiguity highlights the tacit nature of knowledge. Explicit knowledge is usually fully-documented or expressed in writing (Hansen, 1999). Tacit knowledge is unarticulated, action-oriented, and contextual, which cannot live without the participation of 'knowing subject' for sense-making and application (Ambrosini & Bowman, 2001). Tacit knowledge is embedded in individual cognition or experience, so that it is not easily codified, with less visibility and more difficulties to communicate or share with others (Bonache & Brewster, 2001; Leonard & Sensiper, 1998). In general, knowledge tacitness suggests that 'we can know more than we can tell' (Polanyi, 1967). In the interorganizational context, when tacitness is high, organizations tend to closely cooperate, as in joint ventures (Pisano, Russo, & Teece, 1988), in order to learn specific technological processes from other companies.

Causal ambiguity is also understood as knowledge complexity, which captures the number of interdependencies between actors and processes (Simonin, 1999). As suggested by Mosakowski (1997), "in addition to the causal ambiguity associated with each piece in the system – i.e., each subunit in a highly integrated firm – there may be causal ambiguity associated with the interdependencies linking them" (p.422). Complex knowledge is also less codifiable so that it takes more effort to communicate and understand (Kogut & Zander, 1992). Each particular item of knowledge might involve a set of context-specific technologies, norms, individuals, and resources so that the totality of the knowledge is not easily understandable and transferable.

Specificity is another dimension critical to the understanding of knowledge ambiguity. Specificity refers to the "transaction-specific skills and assets that are utilized in production processes and provision of services for particular customers" (Reed & DeFillippi, 1990, p. 89). Since the knowledge transfer process is inherently interactive and dynamic, Shariq (1999) emphasizes that the transfer process itself can transform and accrete knowledge. This highly contextual specificity of knowledge impedes direct knowledge transfer among individuals (Thompson & Walsham, 2004).Without sufficient understanding of the new context, the same knowledge applied might not achieve the desired results (Szulanski, 1996). Thus, specificity of knowledge highlights the significance of context in generating meaning.

Meanwhile, knowledge ambiguity goes beyond the attributes of information and the context. The tie strength between the knowledge seeker and the knowledge source is another dimension of knowledge ambiguity (Leonardi & Meyer, 2015). When two parties have strong social relationship, the knowledge source will be more willing to take time and efforts to benefit the knowledge seeker with the belief that the knowledge seeker will not undermine the source's own power and interest (Majchrzak, Jarvenpaa, & Hollingshead, 2007). With a strong social connection, both knowledge seeker and knowledge source will have a better understanding of how to approach each other and a better prediction of the potential reactions from each other, which offers the conversational material for effective knowledge transfer (Leonardi & Meyer, 2015).

Alongside knowledge characteristics, context, and social relationships, the competence of the knowledge seeker is another factor leading to the perception of knowledge ambiguity. Absorptive capacity of knowledge-seeker, which is the ability to

value, assimilate, and apply new knowledge (Cohen & Levinthal, 2000) has been argued as a factor of knowledge ambiguity. Knowledge seekers with higher levels of absorptive capacity are more likely to comprehend and apply the knowledge given in an effective way (Szulanski, 1996). They are more comfortable with the information content and context, and such familiarity largely eases the efforts of knowledge identification and transfer (Simonin, 1999). "Experienced firms are more likely to possess the relevant tacit know-how to fill in the gaps left by codified descriptions" (Pisano et al., 1988, pp. 58-59). Thus, the lack of prior experience in the relevant knowledge domain is a significant source of knowledge ambiguity.

While knowledge ambiguity has been widely studied in the inter-organizational context as a source of competitive advantage and in the intra-organizational context as a barrier of knowledge transfer, its origins in the early entrepreneur's knowledge-seeking process are less discussed. It is this gap in the literature that the present study addresses. Therefore, the first research question aims to understand what the factors are leading to knowledge ambiguity.

RQ1: What are the sources of knowledge ambiguity in the context of early stage entrepreneurship?

Distinct from knowledge ambiguity, knowledge uncertainty has also been used as a gauge for evaluating information-seeking effectiveness. Knowledge uncertainty is conceptualized as a cognitive state that reflects the discrepancy between the knowledge desired and the quality of that acquired (Ramirez, Walther, Burgoon, & Sunnafrank, 2002). The prevalent use of various computer-mediated communication channels enables the access of knowledge in new and unique ways and influences the perceived

uncertainty among individuals. This measurement is important because knowledge acquired through different media channels has the potential to influence the level of uncertainty present (Planalp, Rutherford, & Honeycutt, 1988). Relevant theories related to the effectiveness of knowledge-seeking include social presence theory, media richness theory, channel complementarity theory and social influence theory. In addition, personal preferences also influence media choice.

Social presence theory. People using different media have varying levels of awareness of the other person in a communication interaction (Sallnäs, Rassmus-Gröhn, & Sjöström, 2000). For example, textual media such as email and messaging cannot capture non-verbal cues, visual cues, voice tone, or information about the sender's age, locale, gender, etc. Although the attenuation of these social cues reduces information about communicator's identity and social characteristics, this attenuation may enhance the impact of the cues that are conveyed (Haythornthwaite, 1996) and keep the conversation more task-focused. For example, the absence of facial expression in email communication will highlight the content of the written text. Meanwhile, textual media also provide considerable support for group communication due to information storage and the ability to control participation and access (Culnan & Markus, 1987). Mediated communication is also reported as a means to maintain social distance as people of poor social relations might prefer less social presence. In sum, the reduction of social cues does not undermine the effectiveness of communication and knowledge transfer.

Media richness theory. The motivation and substance of a communicative act determine the media selection. Media richness captures "the medium's capacity for immediate feedback, the number of cues and channels utilized, personalization and

language variety" (Daft & Lengel, 1986, p. 560). People select media whose richness best matches the ambiguity level of the task (Fulk & Boyd, 1991). Face-to-face communication is the richest medium, followed by video chat, telephone and written documents. Media richness theory elaborates social presence theory by identifying the need to consider message content as well as the medium. Thus, communication media can be differentiated based on their capacities to resolve ambiguity.

Channel complementarity theory. The development of new communication technologies either displaces or complements the use of older communication channels (Ruppel & Burke, 2014). For those holding the displacement view, the prevalent use of various new media might not lead to an increase of communication across all the media channels. An alternative view—channel complementarity theory—suggests that "the rising tide lifts all boats:" increased use of one channel is associated with the increased use of other available channels (Dutta-Bergman, 2004). For instance, people's online community activities parallel their offline community activities (Dutta-Bergman, 2006). People who spend more time using the internet report greater face-to-face communication (Kraut et al., 2002). The more frequently people use instant messaging, the more frequently they communicate via email and cellphone in that relationship (Ramirez Jr & Broneck, 2009). The integration of channels is subject to the nature of relationships. For example, the complementarity of phone calls and text messaging was stronger in closer relationships than the link between use of phone calls and video chat (Ruppel, Burke, & Cherney, 2017). In general, channel complementarity theory highlights the influence of internal motivations on media choice for knowledge-seeking.

Social influence theory. Social influence theory argues that media perceptions are socially constructed such that they vary across individuals in systematic ways (Fulk, 1993). By including group norms and usage in explaining media perceptions, social influence theory emphasizes the cooperative use of media. For example, pairs of workers tend to form common ground by coordinating both the content and process of what they are doing in order to minimize joint communication efforts (Clark & Brennan, 1991). In the community context, people tend to follow the 'critical mass' to adopt media based on their perceptions that there are enough people using the same media (Markus, 1987). People also adjust their own behavior by observing others' behavior and their emotional reactions (Fulk, 1993). Collectivity plays a critical role in influencing individual media use and perception of knowledge-seeking effectiveness.

Personal preference. Beyond rational, social influence and affordance factors, scholars also recognized the significance of personal preference and organizational environment in media selection. For example, people might favor using some media because of their own media styles rather than any external factors (Rice & Case, 1983). Communication competence in the workplace, including knowledge and sensibility, is another reason leading to different media use (Monge, Bachman, Dillard, & Eisenberg, 1981). At the same time, individual media choice is also a result of such organizational forces as resource availability and culture (Fulk, Schmitz, & Steinfield, 1988). While personal, social, and contextual factors influence knowledge-seeking effectiveness, many researchers bring preconceived notions to their analysis of entrepreneurs' resource access, focusing on either online channels or offline activities.

Overall, the above-mentioned theories suggest a variety of factors contributing to knowledge uncertainty, for example, the information asymmetry between knowledge seeker and knowledge source (Ardichvili & Cardozo, 2000; Kirzner, 1997), and the different level of content exchange in computer-mediated communication environments (Walther & Parks, 2002). Recent research draws particular attention to the affordances of various communication channels for entrepreneurs to establish social network and develop new ideas.

Communication channel for entrepreneurs. In the entrepreneurial context, communication technology enables myriad ways of building interorganizational social relations and supporting interactions. Computer-mediated communication (CMC) can provide the benefits of networks without their costs in terms of time, capital and other resources (Zack & McKenney, 1995). CMC technology provides easy addition and deletion of social connections along with the evolution of relationships and offers central platforms for information sharing (Monge & Fulk, 1999). When an entrepreneurial organization builds up online connections, it "quickly embed[s] itself in a vast network that includes large numbers of potential audiences, who gain a rapid access to the new firm and an awareness of it through advertising, search engines, or online communities" (Morse, Fowler, & Lawrence, 2007, p. 143). Social media affordances such as digital user profiles, search, digital relations, and network transparency are the features unique to online networking that underlie the study of entrepreneurs' network-broadening behaviors (Kane, Alavi, Labianca, & Borgatti, 2012; Smith et al., 2017). The use of online communication channels increases the entrepreneur's knowledge pool.

While social media offers unprecedented opportunities for entrepreneurs to connect with external resources, traditional offline social activities are beneficial in helping establish physical co-presence and face-to-face interaction. In offline social settings, the most significant advantage for communicating and networking is geographical proximity (Owen-Smith & Powell, 2004; Sorenson, 2005). Even with the use of communication technologies, communication partners still need to overcome the differences in local physical context, time zones, culture, and language (Olson & Olson, 2000). Spatial proximity enables individuals from diverse social circles to meet and interact (Hampton, Lee, & Her, 2011).

Compared to online communication, offline face-to-face communication has its advantages in conveying complex information and building trust (Lowry, Roberts, Romano, Cheney, & Hightower, 2006). In face-to-face conversations, entrepreneurs have better opportunities to learn from each other in terms of how to improve their ideas and how to develop new ventures. Entrepreneurs communicate with other people in various social activities to gain feedback and co-create opportunities, which can lead to commitment from potential partners (Sarasvathy, Dew, Velamuri, & Venkataraman, 2003). The frequency of offline communication implies the amount of information entrepreneurs could gain and the potential of entrepreneurs to effectively use the information.

Most of the prior literature examined different media channels separately by focusing on either CMC technology's strength in enabling social interaction, or offline activity's advantage in trust building. In addition, these studies generally focused on social networks development as the goal of communication. However, there is a dearth of

discussion regarding how entrepreneurs prioritize and strategically use various media channels to mitigate the negative impact of knowledge ambiguity or even leverage it for knowledge-seeking. Therefore, the second research question is as follows,

> **RQ2:** How do early stage entrepreneurs select media when they are engaged in knowledge-seeking processes and how do they use various media channels to cope with knowledge ambiguity and uncertainty?

In summary, in reviewing prior literature on the composition of entrepreneurial knowledge and the factors affecting knowledge access, chapter 2 proposed two research questions regarding the sources of knowledge ambiguity and early stage entrepreneurs' coping strategies.

Chapter 3

The Influence of Prior Experience and External Communication

The purpose of this chapter is to understand how entrepreneurs' prior experience influence their knowledge access. Prior experience is considered one of the essential factors in influencing entrepreneurs' aspiration and their satisfactory level of information (Gavetti, Greve, Levinthal, & Ocasio, 2012). Since experience is the antecedent of present and future states (Reuber & Fischer, 1999), it is important to take temporal considerations into account when studying entrepreneurs' behaviors.

Prior Experience and Perceived Knowledge Access

Prior experience influences the entrepreneur's ability to comprehend, extrapolate, interpret, and apply new information (Heil & Robertson, 1991). People have different capacities for innovation or opportunity discovery because of their idiosyncratic prior knowledge (Shane, 2000; Venkataraman, 1997). Prior work examining the effect of entrepreneurs' experience on organizational outcomes is fragmented and inconclusive (Lee & Tsang, 2001). Most studies asserted that prior experience, either managerial or industrial experience, will positively influence venture performance (Stuart & Abetti, 1990; Van de Ven, Hudson, & Schroeder, 1984). But sometimes experience may turn into a liability that constrains entrepreneurs' behaviors and impedes the development of emerging organization. For example, substantial industry experience may be an advantage for entrepreneur to perform more efficiently when starting a new venture in the same industry, but at the same time it can be a stumbling block inhibiting entrepreneur's awareness of alternatives (Reuber & Fischer, 1999). Therefore, entrepreneurs' experience could either promote or prohibit startup performance depending on the context.

There are multiple approaches in defining the major dimensions of prior experience. For instance, Lee and Tsang (2001) argued that entrepreneurs' experience includes three main components: entrepreneurial, industrial and managerial. Entrepreneurial experience reflects the number of previous new venture involvements (Stuart & Abetti, 1990). Industry experience refers to the prior experience in the industry of the new venture. Managerial experience is the years of management regardless of industry.

Another line of research differentiated the types of entrepreneurs based on the role of prior startup experience. For example, novice entrepreneurs are those with no prior business ownership experience as a founder, an inheritor, or a purchaser while habitual entrepreneurs are people with prior business ownership experience (Ucbasaran, Westhead, & Wright, 2001). Serial entrepreneurs are individuals who have sold or closed their last business before their current business. Portfolio entrepreneurs are those who have retained their last business but at a later date have established another business. Build on prior scholarship, dissertation asserts that the breadth and relatedness of prior experience, as well as prior startup experience are particularly important to understanding entrepreneurs' knowledge-seeking behaviors.

Breadth of prior experience. Scholars found that the 'breadth of managerial experience,' which combined managerial and industrial experience, had a significant effect on venture successes (Duchesneau & Gartner, 1990). Breadth of prior experience is defined as "the range of an entrepreneur's past work experience across different industries, organizations, and functional areas" (Stam, 2010, p. 632). Entrepreneurs who develop more experience during their career will become better at identifying network

structures and potential opportunities (Janicik & Larrick, 2005). Entrepreneurs with broader prior experience have accumulated a wide array of skills and relationships compared to those with single career concentration.

On the surface, it looks apparent that breadth of prior experience is associated with better knowledge access. However, past research has not addressed this relationship explicitly, with only Stam (2010) considering breadth of prior experience as a moderator between event heterogeneity and network brokerage. In sum, breadth of prior experience is closely relevant to knowledge access as prior experience determines entrepreneur's cognitive state and social capability for enacting opportunities (see Figure 4). Therefore, it is hypothesized that:

H_1. Breadth of prior experience is positively associated with perceived knowledge access.

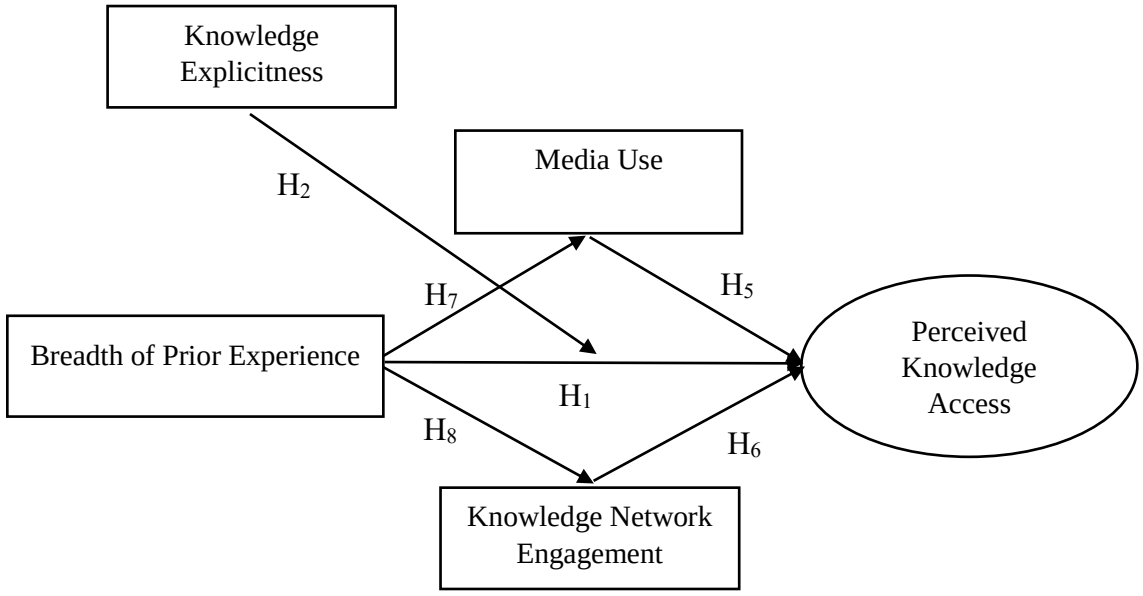


Figure 4. Hypothesized Model of the Breadth of Prior Experience

Knowledge Explicitness. Knowledge has often been categorized in a binary split, between tacit and explicit, external and internal, individual and organizational, procedural

or substantive because of these subject areas' different effects on organizational function (Alvesson, Kärreman, & Swan, 2002; Bonache & Brewster, 2001). The most common distinction in knowledge is between the content perspective (i.e. explicit knowledge) and relational perspective (i.e. tacit knowledge) (Hayes & Walsham, 2003). Explicit knowledge can be easily documented and expressed in writing (Hansen, 1999). Tacit knowledge is unarticulated, action-oriented, and contextual; that is, knowledge that cannot live without the participation of 'knowing subject' for sense-making and application (Ambrosini & Bowman, 2001). Tacit knowledge is embedded in individual cognition or experience, so that it is not easily codified, with less visibility and more difficulties to communicate or share with others (Bonache & Brewster, 2001; Leonard & Sensiper, 1998). Tacit knowledge not only includes task-related dimensions, but also accounts for social and cultural dynamics at the interpersonal and organizational levels (Ellison et al., 2015).

When knowledge explicitness is low, the components of knowledge are usually very abstract and complex so that they 'hide' from people's recognition, making the desired knowledge ambiguous to both knowledge seekers and knowledge sources (Law, 2014). While it is assumed that the cognitive scheme of entrepreneurs with a wide array of experiences about how and where to retrieve knowledge is more developed than entrepreneurs with narrower career path, such cognitive advantage is less obvious when the new knowledge is less easily articulated and well-documented. Therefore, it is hypothesized that:

H_2. The positive impact of having broad range of prior experiences on perceived knowledge access will be reduced when knowledge explicitness is low.

Relatedness of prior experience. The relatedness of prior experience gives entrepreneur uniqueness and inimitability to start new organizations (West & Noel, 2009). Traditional research focus on counting the founders' years of experience (Frédéric Delmar & Shane, 2006) may be misleading as it fails to recognize the fuzzy industry boundaries in today's society (West & Noel, 2009). For example, under the "Information" industry listed by the 2017 North American Industry Classification System (NAICS) of U.S. Census Bureau, there are 6 entries for different types of information businesses[1]. The single entry "Motion Picture and Video Industry" contains 18 sub-categories covering Music Publishers, Postproduction Services, Record production, etc. The variance among these industry sub-categories in organization size, and level of competition could be huge, which suggests that relatedness of prior experience captures better the association of entrepreneurs' past work experiences and current behaviors.

Relatedness of prior experience specifically refers to the knowledge of markets, of ways to serve markets, and of customer problems (Shane, 2000). Chandler (1996) suggests that the similarity between previous job and current entrepreneurial organization could be understood in two dimensions: task environment, and skills and abilities. Task environment delineates the industry relatedness in suppliers, competitors and customers. Skills and abilities is the relatedness of the internal functioning of the business, such as managerial duties and functional duties (West & Noel, 2009). These two dimensions correspond to the industry relatedness and business relatedness covered in this dissertation.

[1] https://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart_code=51&search=2017%20NAICS%20Search

Aldrich (1999) argued that prior experience of entrepreneurs affects their access of knowledge through job-specific contacts, organization or industry knowledge or and the culture of an occupational sub-community. Early stage entrepreneurs with relevant experience tend to have better access to resource holders and have more transferrable context-specific background (Barley & Kunda, 2004). For example, entrepreneurs who were formerly employed in well-connected organizations in Silicon Valley were more successful in raising funding when starting a new venture in the similar industry (Burton, Sørensen, & Beckman, 2002). Influenced by their occupational communities' values and identities, ex-police officers often found detective and home security agencies (Van Maanen & Barley, 1984). However, this perspective, with strong focus on the transferable context and social resources between prior job and current venture, neglects the significant role of the agency of entrepreneur in evaluating their knowledge-seeking process. Thus, a network perspective is employed herein in conjunction with a behavioral strategy approach to better understand how prior experience influences knowledge-seeking.

A network perspective. The search for knowledge is a common response to uncertainty and a premise for decision-making (March & Simon, 1958). Most of the entrepreneurship studies use a network perspective to understand the search process. Entrepreneurs rely on their existing networks, including close social circles with friends and family members, and weak ties with former coworkers and college classmates (Granovetter, 1973; Hanlon & Saunders, 2007). Nascent entrepreneurs in high-status social contexts with affluent families and privileged educational backgrounds, are more likely to enjoy a resource-rich environment. While the network deterministic approach

asserts that initial network ties constrain entrepreneurs' resource exposure, the agentic view of entrepreneurs argues that entrepreneurs can proactively develop new networks to overcome resource shortages. For example, entrepreneurs can negotiate in parallel with multiple potential partners to build new connections with potential investors (Hallen & Eisenhardt, 2012). Therefore, according to the network perspective, prior experience determines the original information exposure but its influence on knowledge access is subject to entrepreneurs' actions in the knowledge-seeking processes.

The behavioral strategy perspective. According to the theory of bounded rationality, entrepreneurs lack complete knowledge to anticipate the consequences of choices so that they tend to pick the first option they expect to be satisfactory (Simon, 1950). When failing to find a satisfactory solution, entrepreneurs then begin searching for alternatives. In this sense, cognition determines the knowledge searching actions. The work of Grossman et al. (2012) illustrated how entrepreneurs choose to activate network ties based on their anticipation of the resources gained from those contacts. The whole search process is contingent upon the factors that determine the satisfactory threshold of knowledge (Cyert & March, 1963). The aspiration-driven search literature shows that during the decision-making process, people compare each option against their aspiration level and choose the one that fits the best (Posen, Keil, Kim, & Meissner, 2018). If none of the options meet expectations, people will either initiate another search or lower their expectations.

Entrepreneurs with higher aspiration levels are less likely to be satisfied with their initial set of choices—the information from existing social ties—and therefore are more likely to form new networks and use more channels to search for alternatives to indirect

ties (Clough et al., 2018). Thus, it is implied by the behavioral perspective that prior experience increases aspiration levels of entrepreneurs, raises the expectation of the knowledge desired, and motivates entrepreneurs to invest in the knowledge seeking process. However, with high aspiration levels, entrepreneurs may be more critical in evaluating the knowledge received thus increase their perception of the difficulty of knowledge access, especially in a highly competitive business environment. It is therefore expected that related prior experience will increase the perceived difficulty of entrepreneurial knowledge access. Therefore, it is argued that:

H_3. Relatedness of prior experience is negatively associated with perceived knowledge access.

Meanwhile, entrepreneurs with very related prior experience are assumed to be more critical about the knowledge received due to their higher satisfactory threshold of knowledge (Cyert & March, 1963). When the knowledge about market conditions, capital, and partnership is well-documented and easily articulated, entrepreneurs are more likely to access desired information in the text-based format such as through government reports, industry newsletters, and private messages from social networks. However, entrepreneurs with related experience will likely to value more on the private information received through social interaction and other less formal channels. Opportunities are seen to be less valuable as they become more available (Cialdini, 1987). Therefore, experienced entrepreneurs' expectation for the desired knowledge increases as the knowledge explicitness increases. It is hypothesized that (see Figure 5):

H_4. The negative impact of having related prior experiences on perceived knowledge access will be stronger when knowledge explicitness is high.

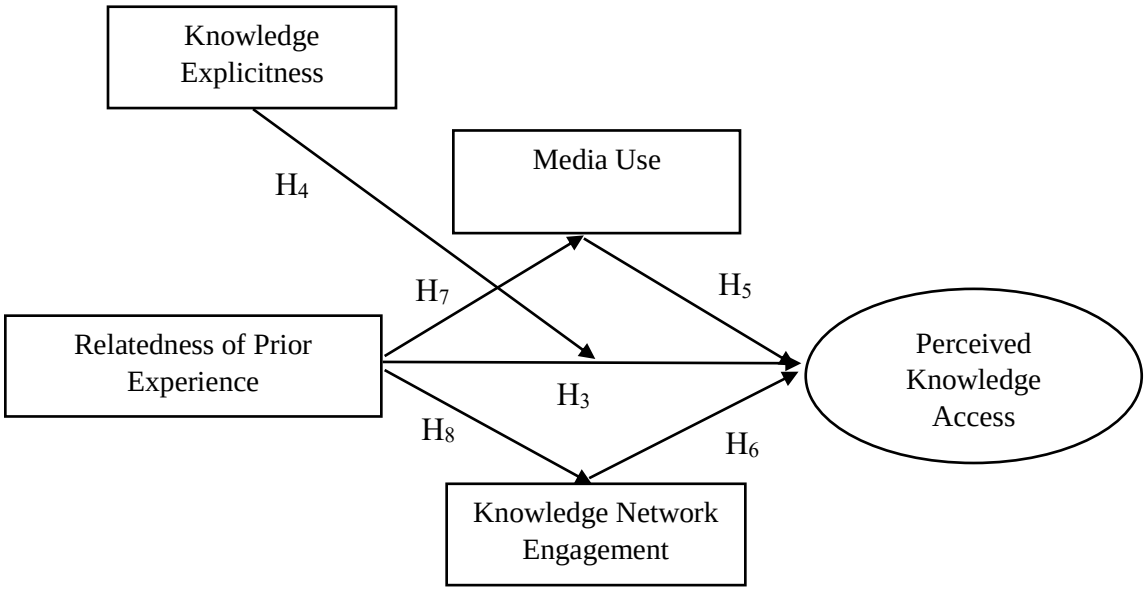


Figure 5. Hypothesized Model of the Relatedness of Prior Experience

External Communication and Perceived Knowledge Access

This dissertation focuses on examining media use and knowledge network engagement as proxy of external communication. Entrepreneurs often access knowledge through communicating with the external environment via their network partners (Kaish & Gilad, 1991). The knowledge network is central to entrepreneurship and of considerable interest in explaining the achievement of desirable organizational performance (Alvarez & Busenitz, 2001). Alternatively, entrepreneurs can also employ a variety of media channels to pursue independent knowledge-seeking, like reading news posts on social media, watching tutorials on YouTube, or leveraging collective intelligence on public forums for problem solving.

User-generated media, considered as a significant disruptive force for how content is created and consumed, has enjoyed fast-growing audience sizes and user-generated media's focus on decentralized creativity also enabled many new forms of organizing (Wunsch-Vincent & Vickery, 2006a). While knowledge network engagement

usually focuses on interactions with strong ties or weak ties, media use offers broader information exposure and larger audience size. However, research to date has not explicitly addressed the relationship between user-generated media use, knowledge network engagement, and knowledge access.

Definition of media use. Media use delineates entrepreneurs' use of media channels for knowledge-seeking either with or without the presence of a specific knowledge source. Media use has been defined in different ways mainly because of the context specific nature of media use and the emergence of new channels. Most studies include face-to-face communication and a variety of mediated forms of communication as media channels. For example, in the organizational context, Haythornthwaite (2005) distinguished media use between co-located and distributed settings. In a co-located research department, media included unscheduled face-to-face meetings (e.g. meeting at the café, hallway encounters), scheduled face-to-face meetings (e.g. classes, research meetings), as well as email, phone, fax, and videoconference. For distance learners, media use includes online group discussion, web-based bulletin boards, 'live' office hours, real time audio for lecturing, private chat, email, phone, and face-to-face meetings. In an academic institution, media use refers to the use of face-to-face meetings, emails, shared documentation systems (e.g. Google Docs) and other social media tools (e.g. Facebook).

Internal communication media use within organizations is more concerned with group communication tools such as audio conferencing and group decision support systems (Scott & Timmerman, 2005). In the interpersonal context, media channels include face-to-face, telephone, text messaging, email, instant messenger, postal mail and

other forms of online communication (Baym, Zhang, & Lin, 2004). The communication media landscape is also constantly changing with the emergence of new channels. For example, a 2018 Pew survey included eight social media platforms- Facebook, YouTube, Instagram, Pinterest, Snaptchat, LinkedIn, Twitter, and WhatsApp-- in comparing media use across different age groups.

Media multiplexity originally referred to the number of channels people use for communication (Haythornthwaite, 2005). Some recent studies augmented this theory by incorporating frequency of media use (Baym & Ledbetter, 2009; Caughlin & Sharabi, 2013; Ruppel et al., 2017). For instance, the frequency of communicating via phone calls, instant messenger, social networking sites (SNS), blogs, other online communication and face-to-face communication is associated with relational interdependence and closeness in friendship (Baym & Ledbetter, 2009; Ledbetter, 2009). Both the diversity of channels and the frequency of usage are important measures of communication behaviors.

Acknowledging that it would be impossible to systematically study every communication channel the early entrepreneur might use for knowledge-seeking, this work focuses on the channels that are most relevant to the business context. A variety of user-generated media platforms, such as YouTube, Twitter, Wikipedia, Reddit etc. were included.

User-generated media. One of the most prominent features of internet is its capability to capture the "collective intelligence" of users. The concept of "participative web" represents an online platform where users are empowered to develop, rate, collaborate on, and distribute internet content and customize internet applications (OECD, 2006a, 2006b). Abundant information and knowledge "embedded in the Web in

the form of data, metadata, user participation and creating links between these" (Wunsch-Vincent & Vickery, 2006b, p. 8) comprise the user-created content. Users not only produce the content but also are empowered to rate and recommend content, which is in contrast to traditional media producers such as broadcasters (Wunsch-Vincent & Vickery, 2006a). The widespread adoption of user-generated media has drastically changed the way people search for and evaluate information.

User-generated media is defined as the new media platform whose content is made publicly available over the internet, reflecting a "certain amount of creative effort," and is "created outside of professional routines and practices" (Wunsch-Vincent & Vickery, 2006b, p. 4). Originating as the bulletin boards on portal sites as Yahoo in the 1990s, user-generated media now encompasses blogs, wikis, video-sharing, social networking, and other user-created platforms (Shao, 2009). In general, there are three types of user-generated media: some of them function as a collective platform of information (e.g. Wikipedia), some others are more like personal sites (e.g. YouTube), and there is also a mix of collective and personal sites (e.g. Flickr) (Lanchester, 2006). Users can choose to engage with these media platforms in three ways, through producing content, participating in community activity, and simply consuming the information (Shao, 2009). These three engagement approaches are illustrated as below.

At the most engaged level, content producers provide information for consumption and entertainment by sharing texts, images and videos. As the lifeblood of user-generated media, content producers leverage self-disclosure on either their personal home pages or public forums to claim an identity for themselves, attract attention from the audience, and develop supportive relationships (Dominick, 1999). In addition, user-

generated media also offers a channel for not only individuals, but also companies and other institutions to seek recognition and fame (Bughin, 2007). Many brands rely on producing user-generated content or forging collaborations with content producers to achieve sales goals (Smith, Fischer, & Yongjian, 2012). Producing original content not only helps achieve the goal of distributing information but also facilitates the formation of identity.

In a less engaged way, people participate for the sake of engaging with other users (e.g. sharing links with each other) and with the content itself (e.g. reviewing the content). Social networking sites such as Facebook are popular platforms to meet people's social interaction needs. When a sufficient number of people engages in an online public discussion, they collectively form a virtual community where the members can develop personal relationships with those who share similar interests and also post their own ideas in a supportive social climate (Rheingold, 2000). When interacting with the content, people might give positive reinforcement to the content producer thus indirectly promote the development of virtual community (Joyce & Kraut, 2006). Although these commenters don't contribute knowledge independently, their involvement in evaluating content increases the social value of information.

At the lowest level of the involvement are those consumers who only watch or read but never contribute any information to the community (such as reading Wikipedia article or watching videos on YouTube). However, these passive consumers tend to account for the most population on digital platforms. As said by a *Guardian* reporter, if one out of 100 people will create content, 10 will engage with the content, and the remaining 89 people will choose to just view it (Van Dijck, 2009). According to User and

Gratification Theory, people mainly use media for information seeking and entertainment (Korgaonkar & Wolin, 1999). Therefore, it is not surprising that information browsing is the most widely adopted way of engaging with media.

People seek information from user-generated media rather than official institutions because they tend to have higher level of trust in peers and they want to "learn how to make sense of things from their peers" (Bowman & Willis, 2003, p. 40). In addition, since the content on user-generated media is usually shorter and more digestible, it is more convenient for people with busy schedules to follow (Shao, 2009; Wolf, 1999). Information is packaged as "bite-size nuggets" to be consumed easily with increased frequency and speed (Miller, 2007). Many different platforms, such as social networking sites (e.g. Facebook), video-sharing (e.g. YouTube), picture-sharing (e.g. Instagram), professional networking (e.g. LinkedIn), microblogging (e.g. Twitter), forums, and blogs, provide tremendous opportunities for people to engage in social interactions. Each of these platforms has its special functions, such as maintaining friendship, building work-related ties, finding resources, attracting potential customers, or developing online reputation. Therefore, it is hypothesized that:

H_5. Media use is positively associated with perceived knowledge access.

Knowledge network engagement. Access to entrepreneurial knowledge depends largely on an entrepreneur's connections to those who possess the knowledge (Klepper, 2001). The network-based perspective holds that a node linking disconnected groups has the advantage in controlling the information and managing the interpretation of that information (Cross & Cummings, 2004). In particular, Burt (1992)'s concept of structural holes indicates that the maximum value of knowledge networks occurs when an

individual's communication partners are not linked to one another (Hansen, 2002). Reagans and McEvily (2003) proposed that network range, i.e. the ties to different knowledge pools, enhance a person's ability to convey complex knowledge to diverse audiences. Meanwhile, networks have also been found to assist in framing and translating complex technology knowledge in such a way that is easier for entrepreneur to understand (Sullivan & Marvel, 2011b). In addition, the technology industry's rapidly changing landscape requires entrepreneurs to keep up with the new technology developments that may influence their product or service (Burgers, Van Den Bosch, & Volberda, 2008), thus network reliance is particularly important when it comes to access of technological knowledge. Consequently, networking opens up new possibilities to entrepreneurs and guides them through information asymmetries (Ardichvili et al., 2003; Sölvell & Larsson, 2006) during the early stages of business. It is thus hypothesized:

H_6. Knowledge network engagement is positively associated with perceived knowledge access.

Prior Experience and External Communication

Entrepreneurs' knowledge-seeking behaviors are contingent upon an individual entrepreneur's capability to identify the target knowledge and evaluate the knowledge received. In this framework, entrepreneurs with less or no prior experience need to cope with limited conceptualizations of problems, and their knowledge-seeking processes thus serve more for the purpose of satisfying than optimizing (Cooper et al., 1995). To the contrary, entrepreneurs with relevant experience are more likely to develop subtle and meaningful cognitive schema to respond to external signals (Lord & Maher, 1990). Cooper et al. (1995) suggested that such cognitive schema will leads entrepreneurs to

better appreciate the information received. Also, based on the idea that building ties with unfamiliar others in unfamiliar contexts requires certain social skills and credentials (Baron & Markman, 2003), and Stam (2010) found that entrepreneurs' prior experience influences their willingness and social competence to initiate new ties at events. In addition, entrepreneurs may seek more information when their relevant experience triggers greater awareness of what is needed and what is possible (Cooper et al., 1995). These previous studies generally emphasize that entrepreneurs' cognitive capacity in seeking new information increases along with their experience in the field.

As entrepreneurs gain experience, they will be more motivated to seek knowledge as their involvement with existing diverse social circles reduces the uncertainty associated with reaching out to new contacts (Burt, 2000). In particular, the involvement of multiple group affiliations has been found to increase experienced entrepreneurs' capability to resolve the tensions of role conflict, thus reduce the uncertainty of accessing knowledge (Krackhardt, 1999). Because of experienced entrepreneurs' prior connections to various external stakeholders, they are more likely to be external-oriented and focus on external communication to manage environmental pressures. As discussed above, external communication refers to media use and knowledge network engagement. It is expected that both the broadness and relatedness of prior experience are associated with these two measures of external communication:

H_7. The breadth and relatedness of prior experience are positively associated with media use for knowledge-seeking.

H_8. The breadth and relatedness of prior experience are positively associated with knowledge network engagement for knowledge-seeking.

In summary, informed by the idea that experience determines how people process information and engage in the search process, chapter 3 associated early stage entrepreneurs' prior experiences with their external communication behaviors, and perceived knowledge access.

Chapter 4

Mentor Engagement and Media Multiplexity

This chapter focuses on examining the dyadic relationship between entrepreneur and mentor. While entrepreneurs' prior industry experience is the foundation of entrepreneurial knowledge (Shane, 2000), scholars suggested that overreliance on personal experience will ultimately limit the ability to recognize opportunities (St-Jean, 2011). Mentors are particularly important in the founding and development of new organizations (Eesley & Wang, 2017; Ozgen & Baron, 2007) because their knowledge, skills, and connections help the novice avoid costly and even fatal mistakes (Sullivan, 2000). An investigation of how entrepreneurs select and engage with mentors contributes to general understanding of the evolving concept of mentorship.

Entrepreneurial Mentorship

The word "mentor" first occurred as the name of Odysseus' son's tutor in Homer's epic *Odyssey*. Clutterbuck and Devine (1985) consider the practice of mentoring as originating from the apprenticeship system where masters, passed down knowledge onto more junior persons or apprentices about how the task was done (Chebii, Bwisa, & Sakwa, 2016; Clutterbuck, Devine, & Beech, 1991). The junior person is usually younger in age or less-experienced in managing an organization. Mentorship is now considered as a development-oriented interpersonal relationship between a more experienced individual (i.e. mentor) and a less-experienced individual (i.e. protégé) (Eby, Butts, Durley, & Ragins, 2010; Eesley & Wang, 2017). Mentors also contribute tremendously in the commitment and self-image of young people (White, 1970) and exert strong social influence on early-career individuals (Tartari, Perkmann, & Salter, 2014) and in early

adulthood (McDonald & Lambert, 2014). Most prior studies have focused on organizationally-bounded mentorship (Kram & Isabella, 1985) with scant attention given to extra-organizational mentorship, a context emphasizing career mobility and lifelong learning.

Entrepreneurial mentoring specifically refers to support for entrepreneurs whose organizations are at the early stages. Early stage entrepreneurs face multiple uncertainties at the organization's formative stage and one way to reduce uncertainty is through interactions with others: mentors, advisors, or investors (Saxton, Wesley, & Saxton, 2016). The role of the mentor is considered important in the early stage learning period when entrepreneurs "have to quickly learn how to handle change, crisis and make strategic decisions" (Deakins, Graham, Sullivan, & Whittam, 1998, p. 159). This reciprocal relationship involves mutual exchange of ideas (Haggard et al., 2011). Mentors help mentees to integrate social resources (Hisrich & Peters, 2002; Huang & Knight, 2017), such as professional advice, feedback, influence, and moral support in order to facilitate the career and personal development of the protégé.

Learning with a mentor is an effective way to help early stage entrepreneurs obtain tacit information to bypass the lack of experience and develop new ways of thinking (Smith, Matthews, & Schenkel, 2009; Ucbasaran, Westhead, & Wright, 2009). While entrepreneurs' interactions with their knowledge networks such as customers (De Clercq & Rangarajan, 2008), venture capitalists (Shepherd & Zacharakis, 2001), partners (Huggins & Johnston, 2010), and incubators (McAdam & McAdam, 2006), have already been studied from psychological and managerial perspectives, this dissertation takes

communication channels into consideration when analyzing knowledge-seeking experiences.

Mentor functions in entrepreneurship. Mentoring, explored extensively within organizational settings, influences outcomes such as turnover (Payne & Huffman, 2005), leadership development (Thakur et al., 2001), job satisfaction (Allen, Eby, Poteet, Lentz, & Lima, 2004), promotion opportunities (Srivastava, 2015), and the establishment of corporate culture (Wilbanks, 2013). In their mentor role theory, Kram and Isabella (1985) identified two general types of mentor functions in the workplace: career development functions, which facilitate the protégé's internal advancement in the organization, and psychosocial functions, which affect the protégé's self-efficacy and personal development. The mentor's contribution to the protégé's career development depends upon the mentor's power and status in the organization whereas psychosocial contributions correlate with the quality of the interaction and the strength of the relationship (Ragins & Cotton, 1999). For example, research suggests that most successful corporate male presidents have had mentors; those male executives who had mentors were awarded higher salaries than those who did not (Jennings, 1971; Roch, 1979). In general, traditional mentor functions reflect organizational structures and power dynamics.

In entrepreneurial context, mentor functions are different from those typical of large organizations, mainly because mentors have no formal hierarchical positions above early stage entrepreneurs and the protégés are typically business owners (St-Jean, 2011). In addition to traditional career development and psychosocial support functions, entrepreneurial mentoring helps early stage entrepreneurs overcome various obstacles,

such as the lack of certain skills, lack of insider information about the field, and lack of social connections to resource providers (Eesley & Wang, 2017). There are six main functions, career development function, psychosocial function, skill enhancement function, socialization function, resource broker function, and investor function, which are introduced as below.

Career development function. Career development is the most widely studied mentorship function in a variety of empirical settings (Kram, 1983). Mentors provide coaching, protection, sponsorship, challenging assignments, exposure, and freedom to pursue skills development to entrepreneurs (Cotton, Shen, & Livne-Tarandach, 2011). Early stage entrepreneurs' limited information about entrepreneurship compared to other types of careers has emerged as one of the key barriers for entrance (Sauermann & Roach, 2016). Therefore, career development support is less about helping entrepreneurs climb the organizational ladder and more about helping entrepreneurs get a more comprehensive understanding of possible entrepreneurial career paths.

Psychosocial function. Psychosocial functions, which include confirmation, counseling, friendship, personal feedback, role modeling, and inspiration, constitute another key locus of support present in both peer mentorship and hierarchical mentorship (Cotton et al., 2011). Recently, self-efficacy has been elevated as an important factor in the entrepreneurial process (Sarasvathy, Kumar, York, & Bhagavatula, 2014). Self-efficacy develops according to the individual's assessment of the availability of resources and constraints that might influence the outcome of behaviors (Ajzen, 1987). Self-efficacy affects the perception of whether a certain goal is attainable (Boyd & Vozikis, 1994). Entrepreneurs' beliefs about their capability for succeeding and tackling

challenging goals influence the development of entrepreneurial intentions and behaviors, as well as the complex process of new venture creation (Boyd & Vozikis, 1994). In some cases, the provision of psychosocial support is not dyadic and interactive, which means that entrepreneurs might perceive a mentor as a role model solely based on their own perceptions without the mentor's awareness or involvement (Gibson, 2004). Indeed, the mere presence of a mentor conveys a sense of companionship when entrepreneurs manage the uncertainty arising from their new venture.

Skill enhancement function. Scholars have linked a wide range of special skills to entrepreneurship, including abstract reasoning, synthesizing divergent ideas, creative framing, improvisation, observation, questioning and experimentation (Baker et al., 2003; Baron, 1998; Dyer, Gregersen, & Christensen, 2008). Entrepreneurship differs from other professions in that there is no available institutionalized knowledge to help early stage entrepreneurs identify the relevant skills or develop these skills in advance (Eesley & Wang, 2017). Mentors with substantial experience can guide early stage entrepreneurs in acquiring tacit knowledge of the profession, such as how to communicate ideas to stakeholders, build initial teams, and navigate external investment.

Socialization function. Mentors also provide socialization for early stage entrepreneurs, helping them "internalize behavioral norms and standards and form a sense of identity and commitment" to the field (Lounsbury, 2007; Weidman, Twale, & Stein, 2001, p. 6). One example is that scientists will be more likely to consider commercial activity from their research labs as legitimate if they have advisors involved on startup advisory boards (Ding & Choi, 2011). Throughout the socializing process, mentors provide insider information and subtleties of local politics and power

(McWilliams & Beam, 2013). The shared context-specific experience between mentor and early entrepreneur may create a bonding effect, which help foster a positive chemistry between them (Deakins, 2000; Stead & Wiggins, 1994). Therefore, the transfer of industry specific information helps entrepreneurs adapt to the new business environment.

Resource broker function. Even with sufficient industry specific knowledge, the lack of direct connections to referrals, resource holders, and endorsement from social ties can be a barrier for early stage entrepreneurs to enter the startup ecosystem (Kenney & Goe, 2004; Stuart & Sorenson, 2007). New organizations are more likely to secure investments and grow their customer base when they leverage their relationships with third parties (Plummer, Allison, & Connelly, 2016; Shane & Cable, 2002). These social connections play a crucial role in early stage entrepreneurs' access to information and resources for setting up a business venture.

Investor function. The evolution of mentorship may benefit entrepreneurs in additional ways. For example, an informal mentor may become an investor or a shareholder in the later stage of organizational growth (Dowejko, Chan, & Au, 2016). Several recent studies have shown that mentors are sometimes expected to be investors when the business is scaling up (Dowejko & Chan, 2018). In the duality of mentor-investor roles, the mentor role may either come as a consequence of the establishment of an investment relationship (Huang & Knight, 2017) or as a precursor to one function (Dowejko & Chan, 2018). Unlike in traditional organizational contexts where mentorship usually comes with an expiry date (Weinberg & Lankau, 2011), mentor-entrepreneur

relationship in the new venture setting can evolve into a more complex interaction beyond initial expectations.

In summary, mentors play a critical role in multiple entrepreneurial processes, from helping potential entrepreneurs identify business opportunities (Ozgen & Baron, 2007), to nurturing early stage entrepreneurs' competencies through learning (St-Jean et al., 2017), to sharing knowledge and connections to support entrepreneurial activities (Radu Lefebvre & Redien-Collot, 2013). Although mentorship has been viewed as one of the most important pillars of an entrepreneurship ecosystem (Isenberg, 2010; Kwon, Heflin, & Ruef, 2013), there are many alternative forms of support for entrepreneurs. The following section differentiates several concepts on entrepreneurial support and discusses the facilitators of mentorship relationship.

Other Forms of Support

It is important to distinguish mentoring from coaching, advising, or consulting, as previous literature has approached them as distinct concepts. Entrepreneurial mentoring, as it is viewed in this dissertation, differs from coaching in both objectives and nature of the relationship (Audet & Couteret, 2012). Coaches provide entrepreneurs with specific skills to address needs, in addition to nurturing the skills that the entrepreneur already possesses (McWilliams & Beam, 2013). Conversely, mentoring has a broader scope, seeking to teach the protégé how to be an entrepreneur in a more general sense as well as to help widen entrepreneurs' personal horizons (St-Jean & Audet, 2012; Thompson & Downing, 2007). Moreover, mentoring is voluntary for the most part whereas coaching usually signals a business relationship where the coach are financially rewarded (Audet & Couteret, 2012). Mentoring signals more comprehensive guidance compared to coaching.

A distinction must also be made between mentoring and advising. Even though these two concepts are often used synonymously, mentoring features regular, consistent interaction over a period of time, whereas advising simply implies the provision of knowledge (Wilbanks, 2013). Thus, an advisor is not necessarily a mentor unless there is regular personal interaction. An advisor is someone who provides direction without attending to specific personal motivations and needs. A mentor, on the other hand, guides protégés to choose their own paths and learn together along the journey. Similar to advising, practitioners also use the term consulting to refer to the assistance from experts, who provide ready-made answers to specific areas such as marketing or engineering in a short-term period (Audet & Couteret, 2012). Compared to advising and consulting, mentoring features social relationships over a longer period and attends to both business and personal needs.

Other than mentorship, entrepreneurs also benefit from several alternative forms of early support such as angel investment (Mitteness, Sudek, & Cardon, 2012), incubators (Amezcua, Grimes, Bradley, & Wiklund, 2013), and seed accelerators (Mejia & Gopal, 2015). For example, angel investors are individuals who invest their own money into a new business either alone or with an angel investment group, and are often motivated to become angels in order to mentor others (Benjamin, Margulis, & Margulis, 2000). Angel investors are willing to pass down the wisdom gained through their experience and often enjoy the opportunity to give back to the entrepreneurial community (Van Osnabrugge, 2000). Incubators and accelerators are considered as the connectors of resources between entrepreneurs and established businesses. These programs are usually one to five years in length (Cohen, 2013). Incubators are mostly publicly owned, operated by governments,

universities, research institutions, or municipal agencies (Bergek & Norrman, 2008). Accelerators have much in common with incubators and angel investors but engage with entrepreneurs for a shorter duration, usually three months, to help early stage entrepreneurs adapt quickly and learn (Cohen, 2013). Since the advent of the first accelerator—Y-Combinator—in 2005, the number of accelerators in the US has increased to over 200 in 2014 while creating more than 16,000 jobs (Mejia & Gopal, 2015).

Such initiatives was considered as "organizational sponsorship," aiming to increase new organizations' survival rates (Flynn, 1993). These attempts mediate the relationship between entrepreneurs and their environments by creating a resource-rich context and offering particular interventions to help with entrepreneurs' developmental activities (Amezcua et al., 2013). One of the resources offered is relational connections (Baum & Oliver, 1991), such as mentorship opportunity.

Although mentorship has been a focus of prior research with regards to its functions in influencing entrepreneurs' career choice and resource acquisition, less studied is how entrepreneurs identify and select mentors at the first place. Within organizations, formal mentoring relationships are designated by the organization employing the two parties based on job function (Audet & Couteret, 2012). Since such formal matching falls short of ensuring interpersonal compatibility or linking between two parties (Ragins & Cotton, 1999), scholars generally advocate informal relationships (Allen, Eby, & Lentz, 2006). Informal relationships develop spontaneously on the basis of mutual identification, which are usually of much longer duration than formal relationships (Douglas, 1997). Mentors select proteges similar to themselves and derive a

sense of contribution to future generations (Erikson, 1963). Protégés search for mentors they deem successful, influential or sufficiently experienced to help them develop a sense of professional identity (Ragins & Cotton, 1999). There are many aspects of the relationship that increase the probability of meaningful and frequent interactions (Allen et al., 2006). For example, Memon, Abd Rozan, Uddin, and Shah (2013) summarized 13 qualities of a mentor from previous literature along the dimensions of objective control (e.g. gender, ethnicity) and subjective control (e.g. trust, shared values). However, few studies have looked into the tensions and strategies when entrepreneurs select mentors. Mentor selection is a strategic decision for entrepreneurs given limited time and resources to identify new ties and build relationships. Thus, the third research question as follows:

RQ3: How do early stage entrepreneurs select and engage with mentors?

Media Multiplexity and Knowledge-Seeking

Knowledge of mentoring is essential in understanding how early stage entrepreneurs gain access to knowledge and resources. However, early literature tends to 'confus[e] the person, the process, and the activities' when discussing mentoring (Hagerty, 1986). Some scholars argue that when discussing mentorship, it is important to explore the tasks associated with the role (Stammers, 1992) as well as the relationship evolution (Dowejko & Au, 2017; Roberts, 2000). It appears that little research has focused on the communicative processes underlying early stage entrepreneurs' seeking of knowledge from mentors and the maintaining of relationships.

Experience cannot be easily transferred from one person into another (Smith & Alred, 1993). People share knowledge through a complex set of interactions with external actors embodying knowledge exchange, coordination and problem solving (Huggins &

Johnston, 2010; Weber & Kim, 2015). Communication is an integral component of knowledge-sharing and innovation (Argote & Ingram, 2000). Technological tools are progressively more capable of supporting knowledge management in organizations (Flanagin, 2002). Communication technologies enable information flow and help teams to integrate diverse perspectives to solve complex problems and generate new solutions collectively (Boland & Tenkasi, 1995; Maznevski & Chudoba, 2000). Many studies have examined how technologies are used within organizations to serve employees' communication and work needs (Haas & Hansen, 2007; Yuan, Zhao, Liao, & Chi, 2013). Very few studies, however, have examined how multiple media channels can be used in combination to support knowledge-seeking needs with external stakeholders such as mentors.

Media multiplexity theory. In order to better understand how entrepreneurs engage with their mentors, it is helpful to turn to the communication literature on multiplexity. Media multiplexity theory highlighted that many interpersonal partners use multiple media to maintain their relationship (Ledbetter & Mazer, 2014; Parks, 2017). Based on a social network perspective, the key argument of media multiplexity is that channel use is driven by relational characteristics such as tie strength, so that stronger ties tend to incorporate more media into their relationship (Miczo, Mariani, & Donahue, 2011). These mixed-media relationships help us understand how media use reflects and promotes social relationships.

Several studies have compared network aspects across media platforms. Haythornthwaite and Wellman (1998) differentiated work ties and friendship ties and found that media use in work relationships is mostly driven by the nature of the task

while the types of media used in social relationships is determined largely by the strength of the tie. Kim et al. (2007) found that mobile phones tend to be used in reinforcing strong ties, and text-based computer-mediated communication (CMC) media tend to be used in expanding relationships with weak ties. Ishii (2006) found differences in media use based on gender, partners' social roles, use of other media, and distance between partners. Online dating partners who used a greater variety of media channels prior to meeting offline reported higher levels of intimacy (Ramirez, Sumner, Fleuriet, & Cole, 2014). Different media allows different degree of interdependencies between communication partners.

Scholars summarized three main attributes of media that inform people's selection and usage of media: social bandwidth, interactivity, and surveillance (Barry & Fulmer, 2004). First, social bandwidth indicates the transmission of social information such as social identity cues and relational cues when using the communication medium (Rice, 1987). The presence of social cues influences the development of relationships. Second, interactivity captures the speed and pattern of the responses and scholars usually distinguish between asynchronous and synchronous forms of communication (Hollingshead, McGrath, & O'Connor, 1993; Walther, 1992). Compared to synchronous communication where partners need to coordinate in time, asynchronous communication allows more independence of action and is less intrusive (Jones, Watson, Gardner, & Gallois, 2004). Lastly, surveillance determines the publicness of interaction—how the communication is influenced by potential third parties. It has been suggested that perceived observation by third parties will influence the communication strategies people use to seek information (Barry & Saunders, 2003). For instance, the visibility of social

media affords people the opportunity to find out what people know and whom they may know (DiMicco, Geyer, Millen, Dugan, & Brownholtz, 2009). The transparency on social media reduces the effort needed for knowledge-sharing (Bregman & Haythornwaite, 2001) and it motivates users to strategically manage their online knowledge communication (Danis & Singer, 2008). Different media afford different aspects of relational development.

Past research on media use in organization largely reinforces the idea that different media serves different communication needs for knowledge-seeking (Groth & Bowers, 2001; Yuan et al., 2013). For example, when seeking contextual or experience-based tacit knowledge, face-to-face communication enables people to learn from observation and permits immediate clarification. Information communication technologies (ICTs) with high synchronicity such as video chat increases communication partners' perceived proximity (Wilson, O'Leary, Metiu, & Jett, 2008) and allows them to use visual cues to build common ground and trust for knowledge-seeking. Some new ICTs such as social networking sites (SNSs) and blogs offer affordances such as visibility and association (Treem & Leonardi, 2012) to signal the connection between information and improve the efficiency of knowledge-seeking. In addition, research on organizations has emphasized the significance of new media platforms in the knowledge-sharing process (Murray & Peyrefitte, 2007). For example, SNSs such as Facebook were used primarily to form mixed-mode relationships from online to offline to foster relationship development and knowledge-sharing (Ellison, Steinfield, & Lampe, 2011). Media multiplexity promotes the complementarity of different communication channels.

Media multiplexity also enhance the flexibility in knowledge-seeking and give both parties more control over the format of communication (Yuan et al., 2013). For instance, when people seek knowledge on asynchronous channels such as email or shared documentation systems (Google Docs), they are able to carry out their tasks at their own pace without spending time waiting for response (Kalman, Monge, Fulk, & Heino, 2002). Social media platforms like blogs also enhance knowledge as people can use one single post to initiate multiplex knowledge-seeking request and facilitate interaction (Yuan et al., 2013). Media multiplexity provides dyads more choices in media selection and the benefits of each channel in an integrated way (Yuan, Carboni, & Ehrlich, 2010). For interpersonal media channels, face-to-face meetings, phone calls, emails, instant/text messaging (e.g. WhatsApp), social media (e.g. Facebook), video chat (e.g. Skype), and collaboration tools (e.g. Slack) were listed (Ruppel, Burke, & Cherney, 2017). Overall, because different media channels complement each other in enhancing the convenience and complexity of knowledge exchange, entrepreneurs who use multiple media will be more likely to obtain desired knowledge from mentors (see Figure 6). Thus, it is hypothesized that:

H_9. The formation of multiplex media ties between entrepreneurs and mentors is positively associated with entrepreneurs' knowledge acquisition.

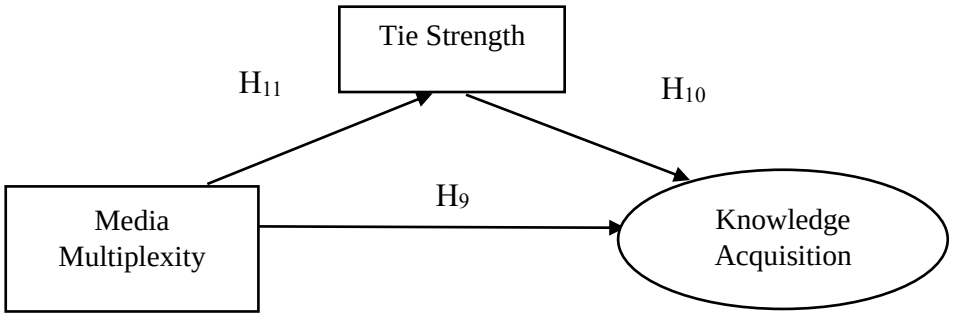


Figure 6. Hypothesized Model of Knowledge Acquisition

Tie strength. Strong ties to other organizations mitigate uncertainty and promote adaptation by increasing information sharing (Kraatz, 1998). Moreover, tie strength typically indicates that actors have high levels of intrinsic motivation and positive affect to engage in a working relationship (Marsden & Campbell, 1984) and contribute to knowledge generation (Sosa, 2011). Strong ties enhance the timing, relevance, and qualify of information that are integral for entrepreneurs to spot opportunity (Burt, 1992). Entrepreneurs also accumulate obligations from others in the close-knit network and accrue influence to leverage these commitments (De Carolis & Saparito, 2006). Tie strength offers a conducive social context for resource exchange.

Successful strategic partnerships contain greater communication intensity (Mohr & Spekman, 1994) and better communication improves mutual learning (Yli-Renko, Autio, & Sapienza, 2001). In studying the relationships between young technology-based firm and its key customer, Yli‐Renko et al. (2001) noted that the acquisition of external knowledge depends on "repeated, intense interaction, and on the willingness of firms to share information" (p.589). Indeed, social interaction enhances knowledge acquisition as it increases role interactions (Ring & Van de Ven, 1994), enables entrepreneur's recognition and evaluation of knowledge (Lane & Lubatkin, 1998) and encourages both parties to exchange and process information (Zahra, Ireland, & Hitt, 2000). Tie strength is often regarded as a signal of frequent social interaction.

Strong ties are particularly important for knowledge-seeking purpose because of the high degrees of ambiguity and uncertainty inherent in entrepreneurial process. "The strength of a tie is a combination of time, emotional intensity, intimacy, and the reciprocal services which characterize this tie" (Granovetter, 1973; p. 1361). Early stage

entrepreneurs are faced with many unanswered questions regarding the product, the market, or even their capability to achieve success (Evald, Klyver, & Svendsen, 2006). In this volatile context, weak ties are not sufficient for exchanging sensitive information (Krackhardt, Nohria, & Eccles, 2003). The strong ties between entrepreneurs and mentors will allow both parties to disclose more sensitive and detailed information. It is hypothesized that:

H_{10}. Tie strength is positively associated with knowledge acquisition of entrepreneur.

Media multiplexity and tie strength. Media multiplexity theory also suggests that people who communicate with partners using multiple media channels will have stronger relationships than those using only one channel because having a greater number of media offers additional opportunities for influence and relational coordination (Ledbetter, 2010). Although media multiplexity has been associated with tie strength, the causal connection between these two concepts is less clear (Ledbetter & Mazer, 2014). In general, it seems that a mutual causality occurs across time between media use and tie strength (Ledbetter, 2010). The initial finding of Haythornthwaite (2000) suggests that media multiplexity is a characteristic of strong tie relationships and many scholars later used tie strength as a predictor of media multiplexity (Miczo et al., 2011).

Another line of investigation viewed tie strength as an outcome arising from multiple media use, asserting that media multiplexity can predict closeness and interdependence in a variety of contexts, including friendship (Ledbetter, 2010), music-based social network (Baym & Ledbetter, 2009), and a multiplayer gaming platform (Ledbetter & Kuznekoff, 2012). In this view, when partners use multiple media to

communicate, they are more likely to share critical knowledge because a greater number of media offer additional channels for social influence and coordination (Ledbetter, 2010). This dissertation takes the second line of reasoning that when entrepreneurs use multiple media channels for communicating with mentors, they will have stronger social relationship. Thus, it is hypothesized that:

H_{11}. The formation of multiplex media ties between entrepreneurs and mentors is positively associated with tie strength.

H_{12}. The formation of multiplex media ties between entrepreneurs and mentors has an indirect effect on knowledge acquisition through tie strength.

Relational Multiplexity

Relational multiplexity is defined as the extent to which two entities (e.g. individuals, organizations, etc.) are joined by differentiated resource exchanges (Hoang & Yi, 2015). For example, within a single relationship between a vendor and an entrepreneurial firm, there could be exchanges of market information, technical knowledge, or capital in addition to the initial transfer of materials (Larson & Starr, 1993). Each content exchange tends to reinforce the other, thus augmenting the overall strength of the relationship (Cotton et al., 2011). Entrepreneurs' knowledge-seeking is fundamentally a social activity; in order to understand knowledge-seeking, we need to understand the relationships that reify it.

Although research on network structure has highlighted the importance of interconnections between partners and the centrality of networks in entrepreneurial processes (Stuart & Sorenson, 2007), this structure perspective did not give enough attention to the qualitative differences of interconnections. Multiplexity incorporates the

"prior research about the importance of individual relationships, their content, and their network structure" (Bliemel, McCarthy, & Maine, 2016, p. 248). Relational multiplexity theory provides a quantitative appraisal of the depth and significance of entrepreneurs' social ties. There are many interpretations of multiplexity, including social multiplexity, relational multiplexity, and strategic multiplexity. These concepts differ according to their relative emphasis on social aspects of the relationship, relationship content, and relationship structure.

Social multiplexity. Social multiplexity features both a business and a social component (Ferriani, Fonti, & Corrado, 2013; Jack, Dodd, & Anderson, 2008). The business relationships are instrumental ties which reflect task-relevant commitments and transactional expectations (Bliemel et al., 2016). On the other hand, the social dimension of multiplexity represents the degree to which two entities are committed to one another's personal and emotional well-being (Huang & Knight, 2017). Scholars have investigated the significance of the social dimension in enriching business relationships (Hoang & Antoncic, 2003), and found that entrepreneurial networks have a tendency toward multiplexity, with relationships starting with a business transaction eventually becoming social relationships (Johannisson, 1996). However, multiplexity may also constrain entrepreneurs' behaviors as business demands can run counter to social commitments (Hoang & Yi, 2015). While the layering of a social dimension on business relationship generally promotes the long-term benefits of both parties, it may not necessarily lead to desirable short-term outcomes.

Relational multiplexity. Recent work suggests that social multiplexity is a dichotomous concept distinguishing business and social relations blurs the distinction

between multiplexity and tie strength (Bliemel et al., 2016). “Multiplexity emphasizes relationship content while strength and embeddedness emphasizes relational context” (Bliemel et al., 2016, p. 257). Therefore, relational multiplexity is a better framing to recognize the multidimensional nature of business relations. For example, within the same dyad, people can think of their partner as supplier, customer, vendor broker, and previous employer (Hite, 2003). Mesch and Talmud (2006) divided multiplexity into activity multiplexity (shared social action) and content multiplexity (the number of topics that a dyad shares). Following Marsden and Campbell (1984), relational multiplexity is not regarded as a central component of tie strength.

Relational multiplexity has been examined both within organizations and in the interorganizational context (Lee & Monge, 2011). For instance, employees involved in multiplex communication networks have stronger organizational commitment (R. L. Hartman & Johnson, 1989). Lazega and Pattison (1999) found that lawyers from a corporate law firm tend to have interconnecting exchanges of goodwill, advice, and friendship. Cross, Borgatti, and Parker (2001) applied network analysis to demonstrate that the five informational benefits of advising relations—solutions, metaknowledge, problem reformulation, validation, and legitimation—form a unidimensional scale such that a contact always provides multiple benefits. Scholars also showed that the multiconnectivity between biotechnology organizations in research, finance, licensing intellectual property, and sales drives network evolution (Powell, White, Koput, & Owen-Smith, 2005). Compared to social multiplexity, relational multiplexity captures more context-specific information.

Strategic multiplexity. Another approach to studying multiple relationships in organizational networks is called the strategic multiplexity perspective (Shipilov, 2012). Strategic multiplexity happens under three conditions: 1) entrepreneurs are simultaneously embedded in diverse relationships, 2) the relationships are interdependent, and 3) the interdependence influences entrepreneurs. While social multiplexity and relational multiplexity focus on the level of a dyad, strategic multiplexity involves two dyads with entrepreneurs as the shared contact between them. Entrepreneurs control the interdependence of relationships and benefit from actively maintaining and exploiting the separation between parties (Obstfeld, 2005). By bridging the unconnected and influencing the information flow, entrepreneurs 'broker' multiple relationships (Burt, 1992; Monge & Contractor, 2003; Nicolaou & Birley, 2003). Thus entrepreneurs who maintain diverse, heterogeneous networks, especially those who bridge 'structural holes,' enjoy more valuable resources and control benefits.

Since the focus of this dissertation is on the multiplexity that is conducive to knowledge acquisition, the relational multiplexity perspective is adopted. Within entrepreneurship, the types of exchange can include technical knowledge, market information, emotional support, and business exchange (Hoang & Antoncic, 2003; Human & Provan, 1996; Larson & Starr, 1993). These categories refer to the content of the exchange instead of the relationship context: work, school, family, etc. (Brass, 2003). Multiplexity is more likely to occur when the market uncertainty is high (Beckman, Haunschild, & Phillips, 2004). Multiple layers of resource exchange between the entrepreneur and the partner increase the inter-organizational independence as well as the value of the relationship, until the point at which the relationship reaches saturation and

the entrepreneurs need to find new contacts for additional resources (Beckman et al., 2004). This dissertation uses the six general functions of mentorship—career development, psychosocial support, skill enhancement, socialization, resource broker, and investor—as a framework in order to explore relational multiplexity.

The extent to which the content exchanged between pairs of individuals in the interactions covers a wide range of perspectives, topics, or domains has been related to the concept of knowledge diversity (Wu, Sha, & Chang, 2012). Scholars have also used knowledge breadth (Gopalakrishnan & Bierly, 2006) and broadness (Hargadon, 2002; Sullivan & Marvel, 2011b) to refer to knowledge diversity. Organizational studies have shown that individuals who access diverse knowledge are more likely to develop cognitive variation to synthesize knowledge and generate new ideas (Simonton, 1988; Sosa, 2011). Knowledge diversity and relational multiplexity between entrepreneur and mentor predicts the richness and depth of social relationships.

Recent work calls for studies associating multiplexity with more diverse performance variables other than organizational growth, such as the entrepreneur's satisfaction with business performance, profitability, and internationalization (Bratkovič Kregar & Antončič, 2016). There still exists a gap in research addressing how relational multiplexity could be achieved communicatively. Some studies contend that intense social interaction lead to relational multiplexity as it promotes the development of common knowledge (Yli-Renko et al., 2001) and makes both parties more comfortable with each other's competence and reliability in knowledge exchange (Ring & Van de Ven, 1994). But focusing on social interaction in general overlooks the subtlety of information exchange enabled by different media channels. Haythornthwaite and

Wellman (1998) studied media multiplexity and relational multiplexity at the same time, but their argument associated both concepts separately with the frequency of communication. Thus, this dissertation aims to explicitly investigate how media multiplexity affects relational multiplexity.

Media multiplexity and relational multiplexity. Many evidences show that the goal of introducing new communication media is not for enhancing the effectiveness of doing old things, but instead for enabling new things that were not possible or feasible with the old technology (Sproull, Kiesler, & Kiesler, 1992). Scholars contend that media multiplexity opens up opportunity to access more diverse knowledge since people can integrate the benefits of multiple media to obtain different knowledge (Wu et al., 2012). In addition, media multiplexity allows the transferring of more accurate knowledge as the layering of each additional media will increase the richness of information (Yuan et al., 2010). Moreover, media multiplexity facilitates the development of shared understanding and common knowledge, which is important for two parties to collectively solve problems and generate ideas (Carlile, 2004). Multiple media use enhances the quality and quantity of information.

Media multiplexity has been associated with people's multitasking behaviors (Su & Mark, 2008). Su and Mark (2008) demonstrated that despite switching among tasks, a significant part of multitasking involves switching between communication partners and among media channels in different organizational contexts. Stephens (2007) explored successive use of communication technologies and suggested that a combinatorial use of ICT could increase the efficiency of accomplishing a variety of tasks and increase the likelihood that communicators will reach the audience. However, Stephens (2007) did not

address how simultaneous or repeated ICT use will influence communication effectiveness.

Media multiplexity increases mutual responsiveness between communication partners by facilitating the formation of common knowledge and enriching the communication content (Carlile, 2004; Wu et al., 2012). Dyads with higher levels of media multiplexity enjoy better expertise responsiveness and therefore have higher-quality and deeper interactions (Sha, Wu, & Chang, 2012). In a study of creativity in dyads, Sha et al. (2012) found that media multiplexity facilitates the generation of new ideas because dyads will have better access to each other when using multiple communication media and they are more likely to offer each other thoughtful answers. Receiving information through multiple media channels also affects the way one perceives information and influences the time one spends on communication-related activities (Thatcher & Brown, 2010). Therefore, it is hypothesized that (see Figure 7):

H_{13}. The formation of multiplex media ties between entrepreneurs and mentors is positively associated with relational multiplexity.

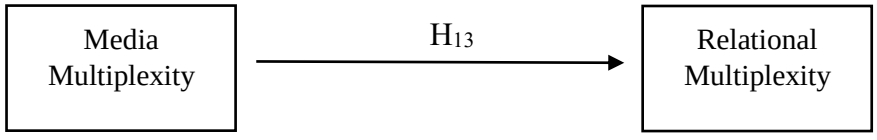


Figure 7. Hypothesized Model of Relational Multiplexity

The Impacts of Gender, Age, Ethnicity

Homophily and media multiplexity. The formation of communication networks is often explained by the principle of homophily, which is the tendency for ties to form between those who share similarities (Monge & Contractor, 2003). “Homophily is one of

the best documented empirical regularities in the study of social relationships" (Clough et al., 2018, p. 24). According to (Brass, 2003)"similarity is sought to ease communication, increase predictability of behavior, and foster trust and reciprocity." Homogeneous networks usually exhibit similar characteristics in sociodemographic, behavioral, and intrapersonal aspects (McPherson, Smith-Lovin, & Cook, 2001). Research suggests that relational multiplexity is associated with homophily among friends who have similar age, gender and ethnicity (Stoller, Miller, & Guo, 2001). People are more motivated to engage in frequent communication with those who are more similar to themselves.

Studies on relationship formation in the entrepreneurial context also widely use similarity attraction theory to explain how entrepreneurs select business partners or investors (Grossman et al., 2012; Hallen, 2008; Vissa, 2011). For example, in studying the networks of entrepreneurs in the U.S., Ruef, Aldrich, and Carter (2003) found that homophily acts as a mechanism that governs the composition of founding teams, as the founders were highly homogeneous by race, gender, ethnicity, and previous occupation. Bounded rationality suggests that entrepreneurs with limited social capital tend to rely on easily accessible information to startup their businesses (Hallen & Pahnke, 2016). Connecting with mentors who share similar characteristics with them will enhance the ease of access and increase the opportunities of building stable and strong ties (Hallinan & Kubitschek, 1988). The following sections discuss three types of similarity – gender, age, and ethnicity – that are likely to influence early stage entrepreneurs' communication patterns.

Age and media use. Age homophily has been mostly examined in friendship and studies shown that age is among the strongest predictors of close friendships (McPherson

et al., 2001; Verbrugge, 1977). Individuals in similar age range possess a ‘distinctive composition and character reflecting the circumstances of its unique origin and history’ (Ryder, 1985, p. 845). Within organizations,, employees of similar age tend to have common non-work-related experiences outside of organization based on their similar social roles (Zenger & Lawrence, 1989). Scholars found that age similarity may produce similar attitudes regardless of industry and tenure, for example, people will have greater job satisfaction and commitment when they grow older (Morris & Sherman, 1981). Further, age has been shown to drive the initiation of unplanned conversations in organizations (Zenger & Lawrence, 1989). Consequently, age similarity implies the alignment of values and experiences, which further drives the formation of relationships.

Although age differences are considered as a characteristic of mentoring relationships in some studies (Hunt & Michael, 1983), scholars question the assumption that the ‘parent-child’ dynamic is conductive to communication and relationship building (Levinson, Darrow, Klein, Levinson, & McKee, 1978). Entrepreneurs will more easily access mentors of similar age and such age homophily will yield a higher likelihood of meaningful interactions. Research has also shown that people of different age group have different media repertoire and use media differently (Van Rees & Van Eijck, 2003). We argue that early stage entrepreneurs will use fewer media channels to engage with mentors of different age groups (see Figure 8). Therefore, it is hypothesized that:

H_{14}. Age dissimilarity is negatively associated with the formation of multiplex media ties between entrepreneurs and mentors.

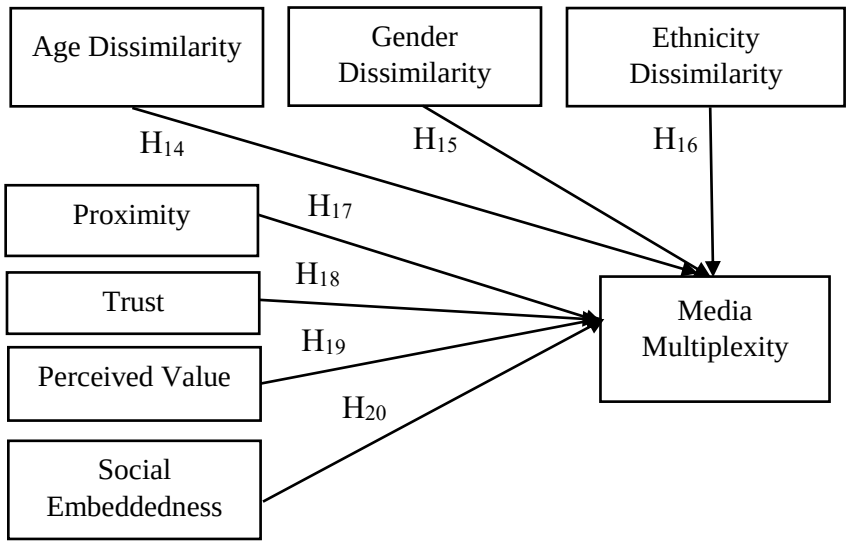


Figure 8. Hypothesized Model of the Predictors of Media Multiplexity

Gender and media use. Numerous empirical studies have explored gender differences in social networks and workplace relationships over decades (Durbin, 2011; Ibarra, 1997; McGuire, 2002). People tend to be professionally attracted to others of the same gender (Byrne et al., 1971). The underlying mechanism of gender-based interaction is the distinct values, beliefs and communication patterns of male and female (Grossman et al., 2012). Female workers' behaviors have been found to be more socially-oriented than males': they tend to emphasize caring, listening, and nurturing at the workplace (Pounder & Coleman, 2002). Moreover, research has shown the impact of gender differences in language use on organizational decision-making (Sheridan, 2007). Gender composition of groups and organizations to some extent determines the network relationships between male and female coworkers (Blau, 1977). Ibarra (1992) investigated men's and women's interaction patterns in an advertising firm and showed that, compared with men's networks that are typified by homophilous ties, regardless of tie content, women are more commonly found to obtain advice from ties to men while

maintaining informal social interaction with women. In general, it seems men and women were more likely to engage in gender-exclusive interactions in organizational settings.

The under-representation of women in entrepreneurship might also influence their communication patterns with individuals of other genders. Research has shown that women were 60% less likely than men to be entrepreneurs (Ruef et al., 2003) and they had significantly lower founding rates in Western Europe (Lerner, Brush, & Hisrich, 1997). For many reasons, women have long been excluded from men's business discussion networks (Rosa, Hamilton, Carter, & Burns, 1994) and research has found that in many countries male entrepreneurs seldom include women in their strong tie circles (Aldrich & Sakano, 1998). Women's low founding rates combined with men's gender heterogeneity in forming strong ties creates considerable barriers to women's access to information (Aldrich, 1999). Consequently, the perception of being in a minority social group might deter female entrepreneurs from seeking information from male resource holders.

In the mentor-protégé relationship, previous research has suggested that same-gender mentoring dyads achieve better outcomes than cross-gender dyads (Feldman, Folks, & Turnley, 1999). In particular, Appelbaum, Ritchie, and Shapiro (1994) found that the pairing between a female mentor and a male protégé produced the lowest level of mentoring effectiveness. But for some specific mentoring functions, same-gender mentoring dyads might not be superior than cross-gender dyads. For example, Ragins and Cotton (1999) found that gender composition does not affect psychosocial mentoring functions. Cross-gender relationship of a male mentor-female protégé dyad was found to realize highest level of vocational mentoring functions (Sosik & Godshalk, 2000).

Despite the divergent findings of the effect of gender composition, much of the reasoning behind gender homogeneity is that a mentor with the same sex is more ready to provide a sense of acceptance and confirmation to the protégé and to serve as a role model (Weinberg & Lankau, 2011). In alignment with these findings, it is expected that gender dissimilarity will play a role in reducing entrepreneurs' motivation to communicate and discouraging entrepreneurs from engaging more diverse media to seek knowledge. Therefore, it is hypothesized that:

H_{15}. Gender dissimilarity is negatively associated with the formation of multiplex media ties between entrepreneurs and mentors.

Ethnicity and media use. Ethnic-based homophily has been found in the relationships between entrepreneur and investor (Bengtsson & Hsu, 2015). This is based on the premise that socially proximate people have lower communication costs (Hegde & Tumlinson, 2014). Following the definition of Kauffman Foundation (Bradford & Mijid, 2016), ethnicity is broadly categorized into four groups: White, Black/African American, Asian, and Hispanic/Latino. Large ethnic disparities exist in enterprise ownership (Fairlie, Robb, & Hinson, 2010), access to financial capital (Mijid & Bernasek, 2013), and awareness of markets (Bates, 2011). Fairlie and Robb (2008) found that White- and Asian-owned firms have higher survival rates than do Black- and Hispanic-owned businesses. Similarly, ethnic gaps exist in self-employment rates (Blanchflower, 2009) and startup performance (Fairlie & Robb, 2007). According to the 2007 Survey of Business Owners, minority-owned businesses account for only 21.3 percent of all U.S. businesses (Robb, 2013). In general, minority entrepreneurs are still underrepresented, and underperforming compared with white entrepreneurs.

There are fewer skilled Black and Hispanic entrepreneurs than White and Asian entrepreneurs, mainly due to less frequent prior family business ownership, lower education levels, and less management experience (Bates, 2011; Fairlie & Robb, 2008). The insufficient skills and exposure of Black and Hispanic entrepreneurs result in less opportunity identification, less motivation to start a business, and less propensity for these entrepreneurs to compete in industries with high entry barriers (Lofstrom & Bates, 2013). There are several reasons that cause Black and Hispanic entrepreneurs to enter industries with lower capital requirements. First, since Black and Hispanic entrepreneurs have lower family wealth levels compared to White entrepreneurs, their new businesses also have lower equity levels (Taylor, Kochhar, Fry, Velasco, & Motel, 2011). Second, Black and Hispanic entrepreneurs encounter more challenges in loan application than do White and Asian entrepreneurs with the same individual level and organizational level characteristics (Blanchard, Zhao, & Yinger, 2008). The disparity in access to funding and expertise among ethnic groups thus serves as a barrier to effective communication and knowledge exchange. Therefore, it is expected that entrepreneurs are more likely to use more media channels to communicate with same-ethnicity mentors.

H_{16}. Ethnicity dissimilarity is negatively associated with the formation of multiplex media ties between entrepreneurs and mentors.

The Impact of Proximity

One underlying force of forming homophilous networks is induced homophily (Clough et al., 2018), which refers to the fact that similar people are more likely to encounter each other. McPherson et al. (2001) suggested that connecting with distant people takes more time and energy than those who are available nearby, as geographic

space not only is detrimental to the presence of relationship but the frequency of interactions. Geographically disparate communication partners have fewer opportunities to share common social contexts and motivations for interaction, which are all important for building network ties (Yuan & Gay, 2006). When physically co-located, workers usually feel more psychologically obligated to engage in social interactions. Geographic proximity plays a more important role in 'determining the 'thickness' of a relationship (its multiplexity and the frequency of actual contact) than it does in determining the presence of a tie' (McPherson et al., 2001, p. 430). Thus, geographical location is an important factor in generating social ties.

People often found it difficult to communicate locational information and make accurate assumptions about the remote situations (Cramton, 1997). Physical and perceived isolation be detrimental to knowledge seeking and effective collaboration (Bartel, Wrzesniewski, & Wiesenfeld, 2012; Sole & Edmondson, 2002). Location dispersion thus becomes an obstacle for people to communicate and form advice-seeking ties. The perceived remoteness deters entrepreneurs from increasing the number of communication channels. Thus, it is hypothesized that:

H_{17}. Proximity is negatively associated with the formation of multiplex media ties between entrepreneurs and mentors.

The Impacts of Social Factors

Trust and multiplexity. Trust indicates relationship quality (Larson, 1992) and it was recognized as a critical factor for knowledge sharing (Hsu, Ju, Yen, & Chang, 2007). Trust along with commitment, is essential for interfirm alliances to engage in cooperative behaviors (Morgan & Hunt, 1994). Chow and Chan (2008) suggested that trust influences

expectations of others' intentions and behavior; people are more likely to favor the knowledge shared by trustworthy colleagues. Trust also encourages knowledge exchange by increasing knowledge sources' willingness to share (Mäkelä, Andersson, & Seppälä, 2012). Further, relations based on trust enhance information processing and reduce stress as partners can spend less time on bargaining and monitoring (Dyer & Singh, 1998; Mohr & Spekman, 1994). What's more, mutual trust increases confidence in each other's good will and flexibility so that people can enjoy broader scope of learning and risk taking (Larson, 1992; Yli-Renko et al., 2001). In general, trust mitigates the risk of communication and smooths the process of knowledge transfer.

Trust here focuses on the benevolence dimension of trust as indicated by Ganesan and Hess (1997). The benevolence of a trusted partner reflects the degree to which that partner's "concern and care" exceed a merely "egocentric profit motive" (Rempel, Holmes, & Zanna, 1985). Trust was found to be a major determinant of relationship commitment by "reducing the perception of risk associated with opportunistic behaviors by the partner, increasing the confidence that short-term inequities will be resolved over a long period, and reducing the transaction costs in an exchange relationship" (Ganesan & Hess, 1997, p. 441; Morgan & Hunt, 1994). The enhanced relationship commitment leads to the focal partner's desire to develop a stable relationship and a willingness to go beyond the costs to maintain the relationship (Anderson & Weitz, 1992). Therefore, the relationship between trust and multiplexity is hypothesized as follows:

H_{18}. Trust is positively associated with the formation of multiplex media ties between entrepreneurs and mentors.

Perceived value and multiplexity. Perceived value is conceptualized as the expected quality and reliability of information given by the focal partner (Johnson, Cullen, Sakano, & Takenouchi, 1996; Moorman, Zaltman, & Deshpande, 1992). This concept focuses on the partner characteristics such as task-specific competencies, reliability on the advice given, and predictability in terms of collaborative behaviors (Ganesan & Hess, 1997, p. 440). Both expectancy theory and social exchange theory imply that perceived value influences communication behaviors. Expectancy theory proposes that individuals are motivated to act based on their perceptions that there is a positive correlation between efforts and benefits (Vroom, 1964). This social psychology approach has been widely adopted to explain motivations in the organizational context (Mitchell, 1982). If people perceive that contacting a person will help solve the problem or make progress on the task, people are more motivated to maintain this relationship and increase the frequency of contact in the future (Allen, 1977). Perceived value is particularly relevant in knowledge search process (Nebus, 2004). Similar to expectancy theory, social exchange theory posits that individuals evaluate the investment costs of their participation in relationship to the returns they receive (Kramer, 2005; Monge & Contractor, 2003). Compared to trust, perceived value focuses less on the motivation of communication and more on the outcome.

Most studies have found that higher perceived expertise or value of certain members makes individuals the target of advice seeking, making them central in advice networks (Gibbons, 2004). Borgatti and Cross (2003) proposed a model of information seeking that is based on the functions of knowing what people know, valuing a person's expertise, gaining timely access to the person, and evaluating the potential costs in

seeking information from the person. Grossman et al. (2012) have argued that early stage entrepreneurs tend to seek out network contacts who have higher perceived value given both the wide-ranging needs and the uncertainty of founding a new business. The perspective taken in this dissertation is aligned: it is expected that entrepreneurs will engage in a wider range of communication activities with mentors having higher perceived value and increase the exchange of resources to maximize their benefits. Therefore, it is hypothesized that:

H_{19}. The perceived value of mentors is positively associated with the formation of multiplex media ties between entrepreneurs and mentors.

Social embeddedness and multiplexity. Social embeddedness has long been argued as a predictor of cooperation and communication effectiveness (Aral & Walker, 2014). While social embeddedness was originally articulated by economic sociologists (Granovetter, 1985), it has been widely applied in the entrepreneurship literature studying team formation (Aldrich, Carter, & Ruef, 2002). For example, based on evidence from 12 venture teams, Chandler and Hanks (1993) found that most team members have prior connections, such as belonging to the same family or having worked together previously. In some studies, social embeddedness refers to the number of connections that two individuals share in a relationship (Easley & Kleinberg, 2010). Other scholars use social embeddedness to suggest the shared affiliations among people – being members of the industry association, from the same academic institutions, or working at the same company (Cornwell & Harrison, 2004; Lattanzi & Sivakumar, 2009). This dissertation argues that both affiliations and common contacts comprise the social embeddedness between early stage entrepreneurs and mentors.

One assumption of social embeddedness is the principal of familiarity, which asserts that "people who associate with one another, under certain conditions, become more likely to continue the association subsequently in other circumstances" (Aldrich et al., 2002, p. 157). Prior shared contexts between individuals contribute to interpersonal familiarity and thus lead to more effective collaboration. Another assumption of social embeddedness is that the presence of common third parties influence people's communication patterns and motivations (Krackhardt, 1998). Embeddedness enables mutually beneficial relationships as noncooperative behaviors will be known quickly in the whole network (Aral & Walker, 2014). For instance, in Simmelian ties, people are directly and reciprocally connected to one another (Krackhardt, 1998). "The appearance of the third party indicates transition, conciliation, and abandonment of absolute contrast" (Simmel, 1950, p. 145). In general social embeddedness stabilizes relationships (Obstfeld, 2005) and facilitates the generation of new ideas (Wu et al., 2012). Research suggests that dyads in Simmelian ties benefit from media multiplexity as they have multiple communication channels to enrich communication opportunities and accessibility (Wu et al., 2012). Thus, it is argued that the fact of being socially embedded will increase individuals' motivation to communicate and to develop deeper social relationships. Therefore, it is hypothesized that:

H_{20}. The social embeddedness is positively associated with the formation of multiplex media ties between entrepreneurs and mentors.

In summary, chapter 4 delineated the significance of mentorship in entrepreneurship and proposed the research questions on how entrepreneurs early select mentors, as well as how does media multiplexity enable the engagement.

Chapter 5

Data and Methods

The following section delineates the data and methods used in this dissertation. Data were drawn from observations, in-depth interviews and questionnaires. The core methods include content analysis and multivariate regression analysis.

Research Context

The following section gives the context of this research and offers details on the locations where data were collected.

Entrepreneurship ecosystem in the NYC metropolitan area. The empirical context of this study is constituted by the knowledge-intensive industries in the NYC metropolitan area. The list of famous NYC-based startups includes Gilt Groupe, Tumblr, AppNexus, Foursquare, and DoubleClick. During 2017-8, NYC observed some notable tech company successes. For example, WeWork is a NYC-based company that provides shared workspaces for entrepreneurs, small businesses and freelancers. WeWork has raised over $20 million as of 2017 and it had acquired several education-related and event-related companies, such as Flatiron School, a coding school offering startup education in Manhattan, and Meetup, a platform used to organize online groups that host offline events. Trello is a project management application enabling users to create and delegate tasks on a virtual whiteboard. This NYC-based company was acquired by Atlassian in 2017 for $425 Million. Yext, an on-line brand management company went public with $116 million raised at $940 Million evaluation in 2017.

Among the seven leading technology regions in the US, only New York notched an increase in the number of VC deals between 2007 and 2011(National Venture Capital

Association, 2016). New York had a 32% increase in VC deals compared to Silicon Valley at -10% and New England at -14 %. NYC has more than 200,000 businesses with 20 or fewer workers, and they employ more than 600,000 employees (Euchner, 2016).

New York State ranked #3 in the nation in terms of employment in the tech sector in 2016, after California and Texas (Office of the State Comptroller, 2017). Based on the 2016 NYC Tech Ecosystem study, NYC's Tech Ecosystem has grown nearly twice as fast as NYC's overall economy, three times faster than the U.S. Tech Ecosystem, and six times faster than the overall U.S. economy (HR&A, 2017). Figure 9 demonstrates the job growth difference between different ecosystems. Compared to other sectors in NYC, tech has the fastest growth rate since 2010, reducing the traditional reliance on the securities industry (Office of the State Comptroller, 2017). The NYC metropolitan area ranked third in the nation in terms of the number of tech patents granted in 2015 behind San Jose and San Francisco, according to U.S. Patent and Trademark Office.

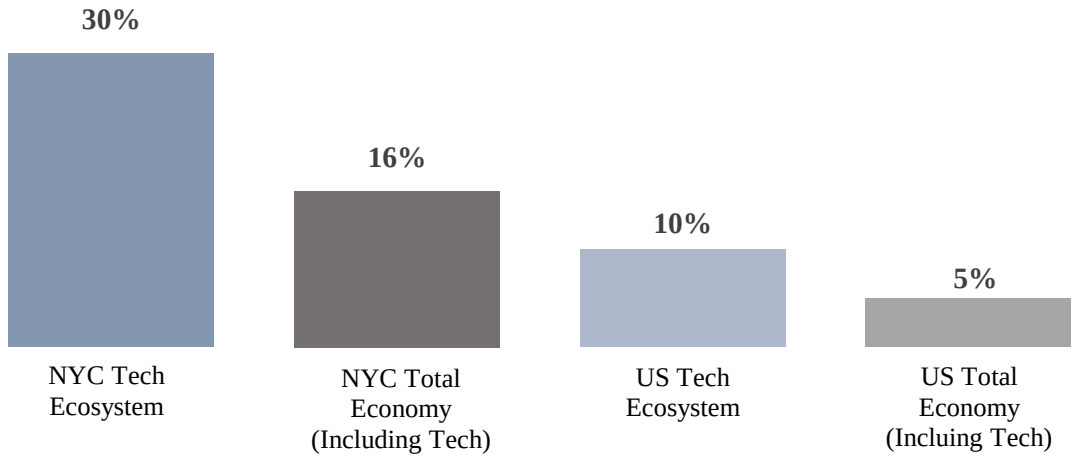


Figure 9. Tech Ecosystem Job Growth 2006-2016. Reproduced from *2016 NYC Tech Ecosystem,* by HR&A Study Update, 2017. Retrieved from http://abny.org/images/downloads/2016_nyc_tech_ecosystem_10.17.2017_final_.pdf

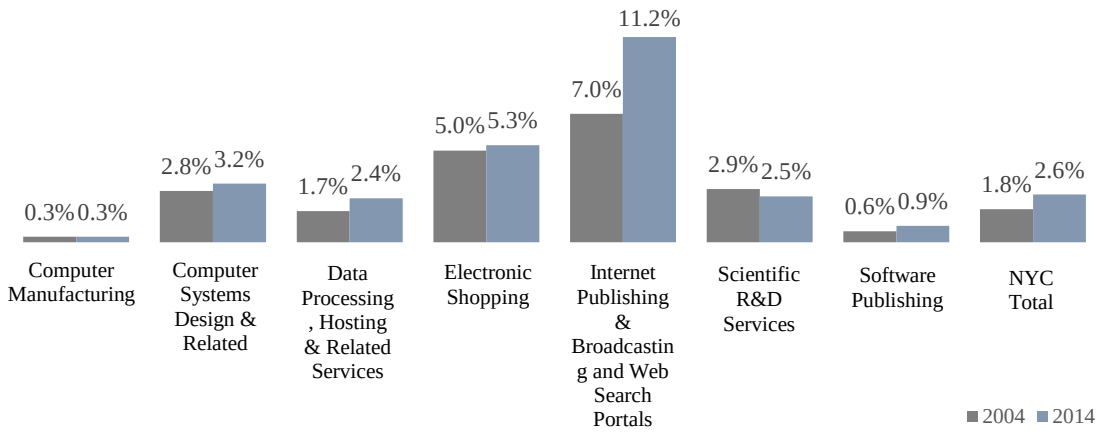
NYC's technology ecosystem had more than 7000 startups as of the end of 2017, provides more than 326,000 technology jobs and it is ranked second in global startup ecosystems (Gauthier, Strangler, Penzel, & Morelix, 2018). The NYC tech ecosystem has grown from $2.3 billion investment in tech startups in 2012 to about $13 billion in 2017. In 2017, NYC had over 9600 startups and more than 100 incubators (Digital.NYC, 2018). NYC's government released the Applied Sciences RFP to expand the city's capacity in the applied sciences to enhance the city's global competitiveness. The city offered seed investment, city-owned land at a set of designated sites, and expedited city approvals process to institutions of higher education, research institutions, and private partners (HR&A, 2017). For example, Cornell Tech obtained approval to build a $2B, two million square feet applied science and engineering campus on Roosevelt Island. The City supported a group of leading academic institutions and private companies in the creation of the NYU Center for Urban Science and Progress in Downtown Brooklyn.

Tech entrepreneurs come to New York City for access to capital, customers, as well as new ideas. New York City has 48 Fortune 500 headquarters, accounting for the biggest portion of the number in the United States (U.S. Census Bureau, 2013). The corporate investment from these established businesses on venture funding and acquisition has largely promoted the development of smaller-sized businesses. The proliferation of startup activity and tech talent in New York City encouraged established businesses such as KPMG, IBM Watson to launch labs to tap into the innovation ecosystem in order to stay current and nimble (Innovation Council, 2016). In addition, New York has a variety of accelerators, incubators, and co-working spaces to support the development of tech community and improve entrepreneurs' access to resources. New

York also offers unique culture and economic diversity to inspire creativity and collaboration. A survey in 2018 showed that over 80% of the tech talents are attracted by the diversity of people, diversity of industry, and cultural options in NYC (Accenture, 2018).

Composition of the Tech Sector. Since there is no consensus on the official definition of the "technology sector," most researchers develop their own definitions to measure employment changes and economic activities (Office of the State Comptroller, 2017). The Federal Reserve Bank of New York listed seven industries "in which firms use technology as their core business strategy" to analyze employment in the tech sector (Forman, 2015). This definition provides a comprehensive measurement of the city's tech sector. Figure 10a shows the NYC share of nationwide tech sector jobs by industry from 2004 to 2014 and 10b is the specific industry distribution in the city. Internet-related industry is the fastest growing subsector with the largest share of nationwide tech jobs. In NYC, the computer systems design industry employed over half of the workforce followed by the Internet-related industry and scientific R&D and services.

(10a)



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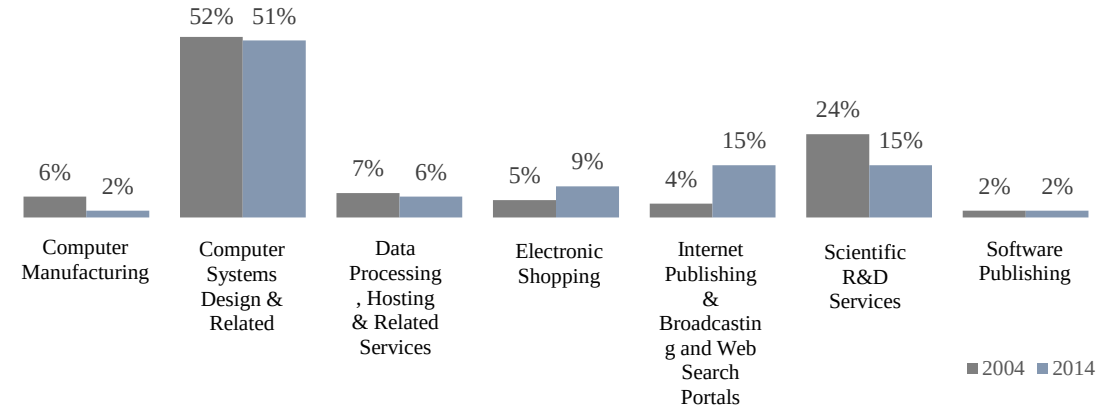


Figure 10. NYC Share of Nationwide Tech Sector Jobs (a) & Industry Distribution of Tech Sector Employment in NYC (b), 2004 vs 2014. Reproduced from *NYC's Tech Profile,* by Center for an Urban Future, 2015. Retrieved from https://nycfuture.org/data/nycs-tech-profile

Office of the State Comptroller defined the tech sector as firms that primarily research, design, manufacture or maintain technologies related to computer systems, software, computer and communication equipment, the internet and biotechnology. Based on the data from 2016, computer systems design, internet-related companies, and telecommunications are the three biggest tech sectors in NYC (Office of the State

Comptroller, 2017). Businesses focusing on computer systems design have created almost half (48%) of the jobs in the tech sector in NYC. Internet-related companies such as Google and Facebook contributed to more than 20% of the jobs. Telecommunication firms, such as Verizon, accounted for 15% of the jobs even though the overall employment rate of this sector is declining. This dissertation's definition of tech sector includes the industries covered by the OSC definition, in addition to some emerging fields and the larger tech community as discussed below.

Emerging fields and the larger tech community. Digital media is the dominant tech subsector in the NYC metropolitan area. For example, Forbes Media, a Jersey City, NJ-based global media organization, has the mission of reinventing the medium, technology, and platform for the modern-day audience. It was among the first major media organizations to successfully transition to digital. In 2018, Forbes Media announced a new strategic investment role to identify areas of future growth in the fields of digital media, fintech artificial intelligence, and blockchain (Forbes Corporate Communications, 2018).

Digital media startups include content providers such as news organizations, informational portals, video sharing platforms; reporters and opinion writers (e.g. Mashable); user-centered content discovery platform (e.g. BuzzFeed), and user-generated content sharing platform (e.g. Tumblr). These companies employ innovative business models with features such as data-driven insights, integrated customer experience, digital marketing, and the leverage of emerging technologies such as mobile and cloud (McKinsey & Company, 2015).

The way in which people consume news and entertainment has changed radically over the past decade and the changing patterns of consumption have created a huge market for digital innovation in the media sector (Deloitte, 2017). The development of digital technologies also offers an entirely new set of opportunities for content creation and distribution. One trend is the rise of on-demand content with consumers in the driver's seat to discover content and generate data about themselves (Edelman, 2017). Sophisticated targeting technology and programmatic buying are at the core of this business format. Another trend is the fan-centric business model that draws on deep learning and data analytics to commercialize fan insights. Music service company Spotify is a good example that uses listening data to turn casual users into high-value subscribers (PWC, 2017).

A recent technological breakthrough in the media industry is the use of augmented reality (AR) and virtual reality (VR) to engage consumers. VR is an artificial, computer-generated simulation of a real-life environment through stimulating consumers vision and hearing. AR is a technology that layers computer-generated enhancements atop an existing reality to enable meaningful interaction with the real world. Interaction-oriented VR/AR technology transforms the way people experience entertainment. In 2016, VR/AR startups have secured funding from large media and communication companies such as Verizon, The New York Times, and Comcast, and achieved 37 equity deals in total (CBInsights, 2017).

The tech sector has partnered with some traditional industries such as journalism and finance to create new opportunities for economic growth and industry transformation. In this way, even non-technology sectors have contributed to the growth of tech jobs in

the city (Office of the State Comptroller, 2017). For example, the Brooklyn-based retail company Etsy is primarily an online platform and in 2016 it acquired an AI-driven start-up to further improve its shopping context. Despite growth industries in fintech, E-commerce, internet, and digital media subsectors within NYC, the city is now a key hub for some emerging subsectors, including advanced manufacturing and robotics, cybersecurity, health and life science, artificial intelligence, big data, and blockchain (Gauthier et al., 2018).

As shown in Figure 11, tech companies are concentrated in Midtown, Midtown South, and Downtown with multiple clusters spread out in Long Island City in Queens and Downtown Brooklyn (HR&A, 2017). Other than NYC, the metropolitan area also includes Long Island, the lower Hudson Valley in the state of New York, northern New Jersey, northeastern Pennsylvania and several large cities in Connecticut. New York's extensive regional transit system provides easy access to the labor pools in these areas. NYC offers proximity to huge potential customer base of digital media, other similar tech companies, and a vast existing media workforce, in addition to its fast-growing venture ecosystem (Accenture, 2014).

Extant literature has explored the significance of geographically-concentrated knowledge flows in research-intensive industries (Owen-Smith & Powell, 2004; Uzzi, 1997). Researchers suggested that high-tech organizations can benefit from the knowledge spillover from nearby knowledge institutes such as universities and non-academic research centers (Dolfsma, 2008; Jaffe, 1989). In sum, proximity is essential to facilitating the diffusion and exchange of knowledge that underlies the creation of new products or services (Carlino, 2001).

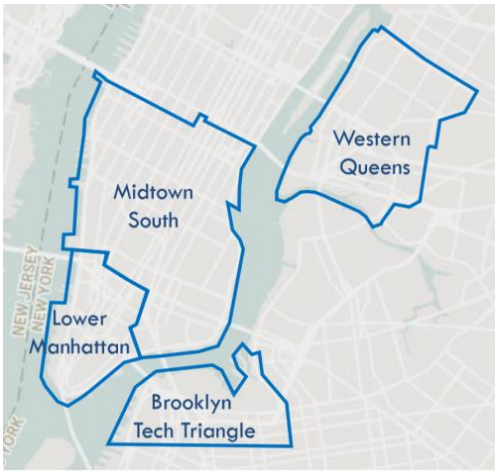


Figure 11. Tech Clusters in NYC; map from original study. Source: *2016 NYC Tech Ecosystem,* by HR&A Study Update, 2017. Retrieved from http://abny.org/images/downloads/2016_nyc_tech_ecosystem_10.17.2017_final_.pdf

Workforce characteristics and diversity. In the NYC metropolitan area, there are 7.72 million 25 and older residents holding Bachelor's or Graduate Degrees (ACS, 2016). According to U.S. Census Bureau, only 25% of the tech workers are women, which is far less than the 50% rate in the overall workforce in 2015. Immigrants play an important role in the tech community, accounting for 47% of the tech jobs requiring technical skills, such as software developers (ACS, 2015).

There is evidence that NYC has the most supportive ecosystem for women entrepreneurs. Based on Dell's Women Entrepreneur Cities Index (Dell, 2017), NYC ranks first overall among 50 global cities for its ability to attract and support high potential women entrepreneurs with a top-ranked operating and enabling environment. Compared to other leading tech hubs such as Silicon Valley and Boston, women entrepreneurs in New York start a greater share of the tech companies. Although the number of women-owned businesses has grown rapidly during the past ten years and had made tremendous contribution to New York's economy, they still face significant barriers to expand their businesses.

Barriers to Growth. The fast-growing tech ecosystem also leads to many barriers for entrepreneurs to survive the highly competitive emerging process. Three main barriers are delineated below: lack of access to knowledge and advice, challenges to scale up the organization, and hiring the right workers.

Lack of access to knowledge and advice. Early stage entrepreneurs are often caught up in pressing day-to-day operations. Although New York City is home to a dozen incubators and accelerators, only a handful of companies can benefit from those high-intensity programs. For example, accelerator program Techstars requires companies to have a developed product and demonstrated value before applying and it usually takes startups several years to just have a shot. Admission is extremely competitive with an acceptance rate of only 2%. The vast majority of startups in New York have limited access to learning opportunities, although the extensive Meetup activity in the city offers early stage entrepreneurs opportunities to obtain advice from like-minded peers (Messina, Gray, Lentz, & Bowles, 2016).

Challenges to scale up the organization. When new businesses try to add employees, their labor costs are compounded by the additional costs of growth, including office space, training, middle management, and various employee benefits. Many entrepreneurs face the obstacles of transitioning from a flat startup team to a company of 20 or more with a clearer division of labor. As indicated by Michael Simas, the executive vice president for the Partnership for New York City, “New York is strong with the start-ups employing one to four people, but there is no growth with the 50-or-more employee companies” (Innovation Council, 2016). When entrepreneurs try to scale up their businesses and move out from coworking spaces to large-scale factories and private

offices, they have to deal with HR, with legal, and all kinds of other expenses by themselves. The growing demand of business calls for entrepreneurs to develop a whole new strategy to handle the hiring, real estate and equipment investments, and decide what parts of the business to outsource and what to handle-in-house. Some businesses move to more affordable regions such as NJ and CT to reduce costs and expand their businesses.

There is also a significant gender gap in scaling up the organization. Women-founded businesses account for only 21 percent of firms with paid employees in New York and they produce only 13 percent of annual total private business revenues (WENYC, 2015). As shown in Figure 12, male entrepreneurs owned 1.5 times more businesses than women entrepreneurs in the city, and their average sales performances are 4.5 times better. Businesses with female founders in New York City tend to stay small whether they want to or not and they face many challenges to scale up their businesses. Over 90 percent of female-owned businesses have no paid employees in the five boroughs, implying that not many women-led startups are advancing to the next level (Messina et al., 2016). There is evidence that a vast majority of women entrepreneurs are "solopreneurs," employing only the owner (Bowles, 2016). The growth of women-led businesses usually is hindered by their lack of capital, training, and limited social connections. In addition, in women-dominant startups industries, such as personal care and health care, many are home-based with an aim to accommodate women's other family obligations, which limit their growth potential. Moreover, some internal challenges, such as a lack of confidence and risk-tolerant attitude are often the reason that women entrepreneurs are less likely to leverage business opportunities. Female-founded tech startups thus have fewer "exits" via an IPO or acquisition, and businesses with

female founder account for only 10% of the 50 companies on the Crain's New York Business ranking of the city's fastest growing businesses in 2015 (Crain's, 2015).

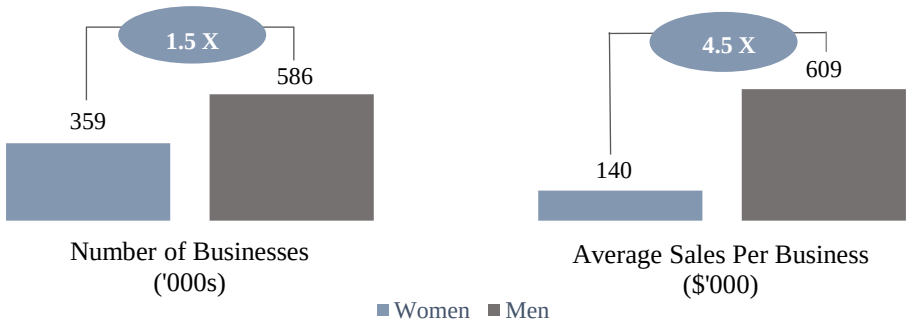


Figure 12. The Entrepreneurship Gender Gap – New York City 2014. Adapted from *Unlocking the Power of Women Entrepreneurs in NYC, by* WENYC, 2015. Retrieved from https://we.nyc/about-we-nyc/

Hiring the right workers. Small business depends on talented workers who can take on multiple roles. For many small businesses with limited budgets and much less oversight capacity compared to large corporations, workers need to possess a mix of skills, experience, and the ability to work independently and stay motivated. Small business also struggles to identify top talents with limited time and experience, so that they often end up with 'good enough' employees (Messina et al., 2016).

Overall, the tech ecosystem in NYC metropolitan area offers a unique opportunity to explore the connections between networking behaviors, the institutional environment, technology use, and entrepreneurial resource acquisition. The NYC metropolitan area is one of the largest urban agglomerations in North America. Scholars have focused on the New York metropolitan area in researching geography of entrepreneurship (Rosenthal & Strange, 2005) and industrial transformation (Orr & Topa, 2006). Accordingly, this research examines a distinct population of entrepreneurs whose boundaries are defined by geographical proximity, common resource needs, and shared environmental pressure.

Research Design

This dissertation adopts a complementarity mixed-method approach based on observations, 20 semi-structured interviews, and questionnaire data from 100 respondents. With this mixed methodology, this study aims to achieve three goals outlined in the work of Rossman and Wilson (1985):1) corroboration, establishing convergence between interview and survey data, 2) elaboration, using interview data and secondary data to provide richness and enhance interpretability, and 3) initiation, suggesting areas for further exploration. Appendix B provides a list of terms used in this dissertation. Both the interview and survey design were constructed with the approval of the Rutgers University Institutional Review Board (see Appendix C for interview protocol, Appendix D for survey questionnaire, Appendix E for informed consent forms, and Appendix F for recruitment message).

Observations. The first stage of the research was field work and observation. The researcher spent over 300 hours in the field in a six-month period from April to October 2018 conducting observations in various activities related to tech startups. The purpose was to be familiar with the broader environment, the language specific to the technology industries, and build up relationships with entrepreneurs (Rubin & Rubin, 2011). Based on the five different types of participant observations proposed by Spradley (2016), the researcher engaged in moderate participation to maintain a balance between "insider" and "outsider" roles. Through observing entrepreneurial activities, the researcher got to know the insiders' conception of reality, which is not "directly accessible to aliens, outsiders, or nonmembers, all of whom necessarily experience it initially as a stranger" (Jorgensen, 2015, p. 4).

The activities were organized by either online Meetup groups (e.g. NY Tech Meetup, Blockchain NYC), local accelerator programs (e.g. NYC Media Lab), tech conference (e.g. TechDay NYC) or University Entrepreneurship Labs (e.g. NYU Leslie eLab, Cornell Tech Runway). The locations of the events included the Barclays-sponsored fintech incubator Rise New York, Capital One Labs, WeWork Chelsea, Made in NY Media Center, the New School, AppNexus, etc. Table 1 shows a list of the sample fieldwork sites that the researcher visited as part of the observational study.

Table 1

Sample of Fieldwork Sites

Name	Type	Location	Organizer
Annual Summit	Conference	Parsons School of Design	NYC Media Lab
Summer 2018 Showcase	Startup pitch	Rise New York	Founder Institute Accelerator
Annual Open House	Co-working space/Incubator	Brooklyn Navy Yard	New Lab
Leslie eLab Open House	University Lab	NYU Leslie eLab	NYU Entrepreneurial Institute
XR Bootcamp Information Session	Incubator program	Parsons School of Design	NYC Media Lab
Startup and Entrepreneur Networking Event	Meetup & Investor Panel	Microsoft	Open Sky Group
Decentralized Network	Meetup	Civic Hall	Blockchain Meetup

During participation, the researcher utilized a combination of observing people's patterns of action and behavior and actively engaging with people to learn about their background and purposes for attending the activities. The role of the researcher during the whole research process, from observation, interviews to survey study, was as an academic researcher. Since tech-related startups are typically highly confidential, the researcher role in an academic institution will help assure entrepreneurs that the nature of the discussion is not business-related, and the usage of the data will not be harmful for

their business activities. When socializing with entrepreneurs and other stakeholders related to the field, the researcher actually joined the community by asking meaningful questions, sharing related information, and introducing useful resources to enhance her reputation as a researcher and her trustworthiness.

Semi-structured interviews. The researcher conducted interviews with 20 early stage entrepreneurs in NYC metropolitan area from August to October 2018. The target of the study was founders or co-founders of the startups or entrepreneurs who were active in trying to start a new business in the past 12 months. Following the model of business phases by Global Entrepreneurship Monitor (2017), nascent entrepreneurs transition from potential entrepreneurs with business concepts to owner of a new business less than 3.5 years old during the early-stage entrepreneurial activity. The emerging organizations run by these entrepreneurs were in their early stages of forming a business plan, launching a product, or developing an organization with a growth strategy. Using public available information, the researcher selected interviewees with diverse backgrounds and with different startup experience levels, in order to increase the validity and reliability of this study. The aim of these interviews was exploratory in nature and served to help understand the entrepreneurship context and the use of different sources for knowledge-seeking practices in general.

The interview locations were either selected by the interviewees or suggested by the researcher, including study rooms in university libraries, meeting rooms in entrepreneurs' co-working spaces, hotel lobbies, public parks and coffee shops. The locations were mostly private for protecting entrepreneurs' identity, interview content, as well as enhancing the quality of recordings. Participants were compensated with a $25

Amazon gift card for participating in the interview. Notes were taken during the interviews and the interviews were tape-recorded with an average duration of 41 minutes each. All the interviews were transcribed verbatim by professional transcription service agent, yielding a total of 360 double-spaced pages of transcripts.

The researcher used a semi-structured interview method to ask about a range of topics, including general questions like "What types of information are generally useful for your day-to-day work?" in addition to media-specific questions like "When is it better to use social media for seeking information and when is it better to communicate face-to-face?" As the interviewer posed each question, probing or clarifying questions were used to generate further understanding of the participant's response, such as, "Could you describe what you mean by___," or "Can you give me an example of ___?" The researcher also included questions about motivation to start the business, interactions with various stakeholders, and their personal stories during the founding process. The researcher followed an ethnographic approach to interviewing, listening to how entrepreneurs explained and conceptualized their lives rather than interrogating the reliability and accuracy of their statements. Focusing on description, experience, and reflection (Spradley, 1979), the researcher asked participants to clarify with specific examples.

The goal of interviewing entrepreneurs was to understand the challenges that entrepreneurs are facing when seeking information during the early stages of founding new ventures and to explore their engagement with mentors or other knowledge sources. Discussions covered basic business information, motivation to start business, information-seeking processes and channels, as well as their selection and engagement

with mentors or other knowledge sources. Through in-depth interviews, the experiences, motives, and opinions of early stage entrepreneurs were revealed. These interviews also allow the researcher to create portraits of entrepreneurs' knowledge-seeking processes and explore contradictory or counterintuitive matters (Rubin & Rubin, 2011).

Recruitment. Three complementary recruitment strategies were employed. First, the researcher made personal connections with entrepreneurs at various entrepreneurship-related or tech-related social events in New York City. With initial face-to-face introduction and rapport-building (Glassner & Loughlin, 1987), the researcher reconnected with these entrepreneurs to explain the premise of the dissertation and ask if they would be willing to participate in one-on-one interviews. Those entrepreneurs were contacted and recruited through LinkedIn or email during August 2018.

Another recruiting strategy used was the snowball sampling technique (Goodman, 1961), where initial participants named other participants who met the eligibility criteria. At the end of the interview, whenever possible, the researcher asked for names of one acquaintance that could be a suitable follow-up participant and requested permission to contact them. Once the names were collected, they were screened based on the recruitment criteria and contacted randomly. There are several advantages associated with the snowball sampling technique. First, this study calls for entrepreneurs to share personal motivations and experiences. Individuals were inclined to participate in such a study if referred by their friends and having some sort of social connection to participants helps to establish credibility. It is easier for the researcher to find people whose characteristics are necessary for this study. The snowball sampling technique allowed the

researcher to identify a diverse set of informants so that the data does not only consist of people with similar participation at the events to which the researcher had access.

Acknowledging the possible sampling bias arising from snowball sampling and convenience sampling, some of the participants were randomly selected from the digital media startups listed on AngelList, an online platform connecting investors, job seekers, and startups. It shows the personal profile of entrepreneurs as well as the company information. This approach avoided the sample selection bias (Heckman, 1977) that might arise from recruiting participants in similar social settings. Regardless of the recruitment strategy, all interviewees were informed of the purpose of the study, the risks and benefits associated with the participation, and intended dissemination of the results. Their written consent for both participation in the study and being audio-recorded were obtained before the interview started. To protect the privacy of participants, all quotes are anonymized, and participant ID were used.

Sample. The researcher contacted 52 entrepreneurs in total, either through personal conversation at offline gatherings, or through online messages via LinkedIn or email. Among the 52 entrepreneurs contacted, 20 participants expressed interests in participating in the research with possible time commitment for a 30-45 minutes interview. The sample size of 20 participants was consistent with the range 15-25 suggested by prior literature with a similar project scope (Polkinghorne, 1989; Trotter II, 2012). Of the 20 interviewees, 6 were female, and we interviewed founder, co-founder & CTO, co-founder & CEO, and potential student founder. The entrepreneurs who participated in the interviews had an average age of 32 and ranged in ages from 25 years old to 42 years old. Table 2 shows the list of interviewees and their gender, age, company

industry, company founded year, and current job title. Four of the entrepreneurs are also full-time graduate students.

Table 2

Interview Participant Profile

ID	Gender	Age	Company Industry	Founded Year	Job title
1	M	32	Cryptocurrency	2018	Founder & CEO
2	M	42	E-commerce	2015	Founder & CEO
3	M	28	Digital Media	2017	Founder & CEO
4	M	25	Virtual Reality	In Process	Masters Student
5	M	29	BioTech	2017	Founder & CEO, Postdoc
6	M	35	Digital Media	2014	Founder
7	F	32	Virtual Reality	In Process	MBA Student
8	M	36	Mobile Payment	2017	Founder
9	F	29	Business Services	2018	Founder, MBA student
10	M	28	Digital Media	2018	Founder
11	M	32	Cryptocurrency	2018	Co-founder, MBA student
12	F	30	Business Services	2018	Founder
13	F	35	Artificial Intelligence (AI)	2016	CEO
14	M	32	BioTech	2017	Co-founder, CTO
15	M	34	EdTech	2018	Co-founder
16	F	35	CleanTech	2017	Co-founder & CEO
17	M	33	Virtual Reality	2018	Founder
18	F	31	Artificial Intelligence	2017	Founder
19	M	26	Artificial Intelligence	2017	Co-founder
20	M	32	HealthTech	2016	Co-founder

Coding and analysis. The analysis started after the first several interviews and continued for one month after the last. Transcriptions were analyzed with a content analysis approach outlined by Krippendorf (2004), which "provides a systematic and objective means to make valid inferences from verbal data to describe and quantify specific phenomena." (Downe-Wambolt, 1992, p.314). Interview transcripts were analyzed using Dedoose, a qualitative data analysis software with a specific focus on mixed-methods research (SocioCultural Research Consultants, 2016).

Guided by previous literature as well as the key themes in this dissertation, I created four broad categories from which to code the data: "business description,"

"knowledge ambiguity," "ambiguity coping strategies," and "selection and engagement with mentors or other advice networks." For each category, line-by-line coding was performed to identify emergent topical codes such as 'doubt on the business', 'challenge in identifying expertise', and 'access news through online community'.

In the second iteration of coding, I was able to identify patterns and descriptions that are connected (Corbin, Strauss, & Strauss, 2014). Codes indicating similar concepts, comparison, and broader tensions were highlighted and grouped together as a theme. This step of theme identification was consistent with the three general sets of aims in thematic analysis suggested by Gibson and Brown (2009): examining commonalities, differences and relationships. For example, "doubt on the business" code was found to highlight the response to the risks in developing the new product or pursuing the entrepreneurial career and it was grouped under the category 'uncertainty management.' Another example is that "challenge in identifying expertise" was found to demonstrate the barriers of accessing talent from certain fields due to the norms and values of the industry or region. It was then grouped under the category "institutional factors." Also, based on the motivation of knowledge-seeking, "access news through online community" was sub-coded as "social media" which belongs to the code "optimize information relevance." At this stage, themes included both broad constructs that link many different concepts as well as more focused items that point to specific kinds of expressions (Ryan & Bernard, 2003).

In the third step, themes were grouped together in categories based on the larger themes they revealed as well as the research questions (Yanovitzky & Weber, 2018). For example, various types of channels use were grouped based on the motivations, such as

"increase information exposure," "optimize information relevance," "change public visibility," "access to indirect knowledge," "increase awareness of knowledge," "enhance communication efficiency," and "specialization within team." These strategies were further grouped into a broad theme "knowledge ambiguity coping strategies."

Reliability and validity. Content analysis is a systematic technique for reducing words of text into fewer categories based on explicit rules of coding (Weber, 1990). Verifying reliability and validity is a critical step in qualitative analysis to check for trustworthiness and consistency of research findings (Morse, Barrett, Mayan, Olson, & Spiers, 2002). Reliability emphasizes the consistency and replicability of the coding to make data meaningful (Yu, Jannasch-Pennell, & DiGangi, 2011).

Code reliability was ensured with a transparent, repeatable, and verifiable process (Gibbert, Ruigrok, & Wicki, 2008). Coding reliability was addressed with a three-stage process. In stage one, the researcher individually coded 25% of the interviews and then met with her academic advisor to draft the coding scheme and codebook. In the codebook, definitions of the codes, rules that demarcate subcategories, and examples were included. In stage two, the researcher conducted a training with a second coder to clarify the coding scheme. In the same meeting, the second coder and the researcher separately coded half of one transcript and convened to reconcile any discrepancies in coding. Through assessing reliability informally during coder training, the coders were able to refine the instrument together. After two coders reconciled all the discrepancies to reach a mutually agreeable code, the second coder continued to code 15% of the total transcriptions. At this stage, a sample of three files was determined based on the suggestion that not less than 10% should be sufficient (Lombard, 2004). Cross-checking

codes for similarity after two coders independently code and assess the use of interview data increases the trustworthiness of the findings (Cook, 2011). Reliability was achieved when two coders with diverse personalities duplicate their research efforts in different environments (Krippendorff, 2004).

While there is no 'best' coefficient to test the intercoder reliability (Lombard, Snyder-Duch, & Bracken, 2002), the researcher adopted Cohen's kappa (κ) that has been commonly used in the coding of behavior in prior literature (Bakeman, 2000). Cohen's κ is the proportion of agreement over and above chance agreement Cohen suggested that values ≤ 0 as indicating no agreement and 0.01–0.20 as none to slight, 0.21–0.40 as fair, 0.41– 0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1.00 as almost perfect agreement. Cohen's κ showed that there was substantial agreement between the two coders' judgements on 74 total excerpts in three interviews, $\kappa = .618$, $p < .0005$. Cohen's κ is statistically different from zero.

Validity refers to whether the data represent the phenomenon being studied and whether the findings are transferable and credible (Bluhm, Harman, Lee, & Mitchell, 2011; Hycner, 1985). Following Hanson, Balmer, and Giardino (2011), the researcher began data coding while still interviewing participants for gauging data saturation based on the emergence of new themes. Through bringing new participants until no new insights emerge and data exhibits redundancy, we can set the sample size and increase validity of the qualitative analysis.

Survey questionnaires. The survey questionnaire included questions about participants' prior experiences, knowledge-seeking channels, knowledge sources, and engagement with mentors. Demographic and business-related questions were included at

the end of the survey. One open-ended question on "what is the biggest challenge for you to access the information" was included since open-ended responses are always richer in quality and also result in less bias, i.e. respondent giving desired answer (Penwarden, 2013). The goal was twofold: to understand not only how prior experiences and communication behaviors relate to entrepreneurs' acquisition of knowledge, but also to explore the influence of media multiplexity on knowledge acquisition in entrepreneur-mentor relationship.

The survey data were collected between September and October 2018 using three formats: the first option was an online survey administered through the Qualtrics survey software; the second option was an offline survey collected on a tablet, and the third option was a paper survey, which was presented to participants in person. For the first option, the researcher either sent out an invitation with survey link directly through Qualtrics email distribution, or copied the anonymous links offered on Qualtrics to various online platforms or directly to individuals. The advantage of using Qualtrics email distribution was that it provided summary on the completion status so that the researcher can follow-up with participants who have not started the survey after a certain period to increase the response rate. Using the anonymous link was another efficient way of distributing the survey since it helped target broader audiences and enabled audiences to further share survey links.

The three surveys were identical in content but with paper survey the researcher prepared two printed versions for the branching question "Do you have a mentor who gives you advice about your startup?" In the online survey or the survey on tablet, people who answer "Yes" were directed to a section asking them to think about one mentor who

acted as an important source of professional advice for their startups. For those who answer “No” or “Not sure,” they were directed to a section asking them to think about one *person* instead of one *mentor*. In the paper survey format, the researcher directly asked this question at the beginning to determine which version to administer.

The eligibility criteria for survey questionnaire was similar as for the interviews. The researcher included a screening question at the beginning to recruit participants who founded a company in the period 2014-8 or who had been active in trying to start a business in the past 12 months. The researcher also included several eligibility criteria both in the recruitment flyer and the survey questionnaire. Participants were limited to those located in the NYC metropolitan area and who are in the technology and business services sectors. Participants were informed at the beginning that the survey is confidential.

Recruitment. Survey participants were drawn from three sources. First, the recruitment information was posted in a wide range of online communities across multiple digital platforms, such as Meetups, WeChat groups and Facebook groups. Meetup is an online social networking portal that facilitates offline group meetings in various localities around the world. Meetup allows members to find and join groups based on common interest. For example, NY Tech Meetup is the largest meetup group in the world founded in 2004. It belongs to NY Tech Alliance, which is a non-profit organization supporting the New York tech community. Other than the monthly events, NY Tech Meetup has an online portal with more than 59,000 members. Recruitment messages and survey links were posted in the discussion sections of all the relevant meetup groups in the NYC metropolitan area. Similarly, over 10 Facebook groups were

identified, including New York Startup Community, Japan NYC startups, NYC Tech Startups Women, etc. Recruitment messages and survey links were posted after obtaining the approval of the moderators. WeChat is a Chinese messaging app providing social networking services.

In order to access the entrepreneurial communities, the researcher first built rapport with gatekeepers to make connections and receive authority for this study. These formal and informal gatekeepers included program managers of incubator programs, managers of University labs, and organizers of Meetup groups. The significance of gatekeepers to increasing participant access has been well-documented (Chikweche & Fletcher, 2012).

The second channel used to identify target respondents was LinkedIn, which is a professional social networking site that reaches over 433 million global users and contains information about a substantial fraction of the U.S. workforce (Horton & Tambe, 2015). Employment histories on LinkedIn contain useful information for identifying nascent entrepreneurs: their current roles, prior employers, skills, and education (Tambe, 2014). LinkedIn allows users to conduct a variety of searches of individuals based on keywords, locations, industries, and connections. LinkedIn also shows all the relevant networks such as co-founders so that it will help identify more entrepreneurs. Additionally, the researcher used AngelList, CrunchBase, and SensorTower, incubator program websites as channels to identify entrepreneurial organizations and follow up by using company websites to access founders' names. After connecting with the founders and co-founders on LinkedIn, recruitment messages and

survey links were sent either as private LinkedIn messages or as invitation links via Qualtrics.

The third channel to recruit participants was through doing fieldwork in various offline channels such as tech meetups, conferences, co-working space and University entrepreneurship labs. The researcher participated in those community events as a researcher from September to October 2018 and built rapport with entrepreneurs on site. Most of these offline settings were in the format of startup pitching, technology demo session, lab open day, and founder showcase at the end of the accelerator program. Some of the interactions started with first the researcher asked about the business idea, then after entrepreneurs explaining the idea, they invited the researcher to share her own experience, feedback and other relevant resources. Reciprocity was highly appreciated in the context of entrepreneur engagement. When the setting was less interactive, such as in a startup pitching session or investor workshop, the researcher approached the entrepreneurs during the networking time before or after the formal presentation to initiate the conversation. In all the cases, the conversations were informal and casual.

During the conversation, the researcher conducted the first round of screening by asking about the business stage and industry. For people who met the criteria, the researcher obtained participants' consent to fill out the survey. In most of the cases, the researcher maintained an unobtrusive status near the participants to ensure their privacy. However, some participants also preferred engaging with the researcher while answering the question, for example, giving the reasons behind their choices, asking for clarification of the meaning, offering suggestions about alternative options, or giving feedback on the wording of the question itself. Through this engaging fieldwork, the researcher was able

to think reflectively about the design of the study as well as the explanation of the survey answers.

Qualtrics' offline app was the main tool used to collect offline data. It allowed the researcher to collect survey data without internet access and then upload all the data at a latter time. It was of tremendous value for collecting data in the field. When there were a group of entrepreneurs, printed surveys were also distributed. For convenience purpose, participants were sometimes given the researcher's cell phone to access the online survey link directly.

Sample. There were 167 survey responses collected in total from the three approaches to data collection. Excluding the incomplete data from people who have opted out of the survey in the middle or those who did not pass the first screening question about their entrepreneur status resulted in 100 completed surveys. Although some respondents skipped several optional questions or some of the demographic questions, these 100 people completed the whole survey processes. Of these 100 participants in the sample, 43 were from the offline Qualtrics tool on tablet, 10 returned a paper survey, 23 were from invitation over email on Qualtrics, and the remaining participants were from anonymous links. According to the trackable invitation over email, the response rate was 9%, which was consistent to the rates of 8%-10% normally obtained in research using internet survey method (Dommeyer & Moriarty, 2000; Ozgen & Baron, 2007).

The majority of the participants were male entrepreneurs (80%). The gender composition in this dissertation sample is consistent with the statistics of the broader social context. A government report in 2015 found that women-founded businesses

account for only 21 percent of firms with paid employees in New York and they produce only 13 percent of annual total private business revenues (WENYC, 2015). In the city's tech sector, women founders are less represented, partially due to the smaller share of women workforce in the major tech industries such as computer systems design and the software publishing field. Women entrepreneurs have been more prevalent in fields like fashion, beauty, design, and food (Messina et al., 2016). The top five types of women-owned businesses in NYC are day care, nail salons, social services, health care, and educational services, where women make up a significant share of the workforce (Bowles, 2016). Therefore, this sample reflects the demographics of male entrepreneurs in the technology startup sector.

More than half (54%) of the participants in this sample were under the age of 30. This distribution accords with the societal trend of North America, which ranks first in the entrepreneurial activity globally for the 25-34 year-old age group, at 23.4% (Global Entrepreneurship Monitor, 2018). However, the sample in this dissertation does differ from previous national studies of entrepreneurs' age distribution. According to a U.S survey in 2014, typical entrepreneurs are in their thirties or forties, an age by which one has accumulated sufficient industry experience and financial capital to start a new organization (Kauffman Foundation, 2015). Some of these young entrepreneurs under 30 are still in school pursuing academic degree, including college students, MBA students, and PhD students.

About half of the entrepreneurs surveyed (47%) were of White ethnicity, more than double the number of Asian/Pacific Islander ethnicity alone, and Black/African American and Hispanic or Latino ethnicity together. Approximately 94% of the

entrepreneurs hold a bachelor's degree or more and 48% of them have completed graduate level education. The educational attainment of in this sample is significantly higher than Kauffman Foundations' data in 2014 where about 20% of the entrepreneurs possessed a graduate degree (Kauffman Foundation, 2015). This percentage reflects the attraction of New York City for highly-educated talents.

Based on the self-reported data of the respondents, 20% of the them were *nascent entrepreneurs,* who were active in trying to start a new business in the past 12 months. The majority of the sample (80%) were owners of new businesses. Moreover, 80% of the organizations were very small in size with four or fewer full-time employees (including the founder themselves). The data corresponds to the hard-to-scaleup problem facing early stage entrepreneurs in the NYC metropolitan area. The percentage of startup companies with total capital raised more than $10,000 (50%) was equal to those with less than $10,000 (50%).

Approximately 32% of the entrepreneurs were from three biggest traditional tech sectors based on New York State Department of Labor's report in 2016 (Office of the State Comptroller, 2017). They were computer systems design, Internet-related and telecommunications. Another 30% of the entrepreneurs were operating in the emerging technology industries, including VR, cryptocurrency, etc. or in healthtech, fintech (financial technology), and edtech (education technology). The sample in this dissertation echoes the growth of new technology sectors in the city. Scientific R&D and business services and consulting together accounted for 15%. The remaining 23% of the entrepreneurs chose the *Other* category and based on their description (e.g. data science, beautytech), they were all considered as in tech- or business-related industries. As

scholars point out, a specific industry context and social-demographic background offers insight into the focal phenomenon of target population (Douglass, Allard, Tenopir, Wu, & Frame, 2014; Fleischmann, Hui, & Wallace, 2017). Table 3 shows the percentages of entrepreneurs by gender, age, ethnicity, education and their company size and total capital raised. Note that data on ethnicity was missing for one entrepreneur.

Table 3
Survey Sample Demographics and Business Characteristics (N=100)

Factor	*n*	*%*
Gender		
Male	80	80
Female	20	20
Age		
20-29	54	54
30-39	32	32
40-49	12	12
50 or more	2	2
Ethnicity		
White	47	47
Hispanic or Latino	11	11
Black/African American	11	11
Asian/Pacific Islander	20	20
Other	10	10
Education		
Some high school	1	1
High school diploma	5	5
Bachelor	46	46
Master/MBA	36	36
PhD, MD, EdD or equivalent	12	12
Current business stage		
Nascent stage	20	20
New business stage	80	80
Total capital		
Less than $10,000	50	50
$10,000-$99,999	20	20
$100,000-$499,999	17	17
$500,000-$999,999	3	3
$1 million or more	10	10
Organization size		
1-4	80	80
5-15	14	14
16-25	2	2
26-49	1	1
50 or more	3	3
Industry		
Computer Systems Design	7	7
Internet-related	22	22
Telecommunications	3	3
Scientific R&D	4	4
Emerging Technologies (e.g.VR)	18	18
healthTech, edTech, finTech, etc.	12	12
Business Services and Consulting	11	11
Other	23	23

Variables and Measures. The researcher developed the survey measures in several stages. In the first stage, survey items were generated mainly by referencing the scales and theoretical bases suggested in existing literature. In the second stage, the researcher explored the interview data and then used the findings to refine some of the survey items. The intent of using this sequential approach was to develop better measurements with specific samples of populations and to see whether data from a few entrepreneurs could be generalized to a large sample of population (Creswell & Creswell, 2017). The second component focused on exploring whether entrepreneurs' prior experience influence their communication intensiveness and knowledge access. The third component investigated specifically how entrepreneurs engage with their mentors.

Perceived knowledge access. Perceived knowledge access was measured with the ease of accessing knowledge when entrepreneurs are planning their business. Participants are asked "When you were planning your business, how difficult or easy for you to access the following knowledge?" Respondents were asked to rate each of the source on a five-point scale, ranging from "very difficult" (1), to "very easy" (5). It includes 6 items, which are 1=Finance, 2= Hiring and collaboration, 3= R&D and technology, 4= Market conditions, 5= Management practices, 6= Career-related. Based on the pre-survey interviews, this question focused on the types of information particularly relevant to the knowledge-intensive industries. The ease of knowledge access was aggregated to a composite score for statistical analysis.

Breadth of experience. Breadth of entrepreneurs' prior experience was measured by the total number of areas that they had experience prior to founding the current venture (Stam, 2010). Entrepreneurs were asked to report their prior experience across six areas, including industry experience, start-up experience, senior management experience, and functional

experience in R&D, marketing and sales, and finance (Beckman & Burton, 2008). There was also an option "None of the above" if people have no experience at all. The measure ranges from a low of 1 with no experience in any of these six areas to a maximum of 7.

Relatedness of experience. This measure includes two dimensions: industry context and business approach. Following West III and Noel (2002), relatedness of industry experience asked about the extent to which early stage entrepreneurs' present company operates in the same or a very similar industry. Relatedness of business experience asked about the extent to which your present company's products, services, or overall approach (e.g. strategy, R&D, operations, marketing, sales, etc.) are the same or very similar to past experience. Both of these questions were measured by a five-point scale where 1= extremely unrelated and 5 = extremely related, following the method used by Tanriverdi and Venkatraman (2005). The score for these two measures was combined to a composite score for analysis.

Media use. This measure assessed the extent to which entrepreneurs engage with diverse media channels for knowledge-seeking. Respondents were asked "How frequently do you use the following media channels to obtain information for your startup? (1=Never, 2=Less than once a month, 3=Monthly, 4=Weekly, 5=Daily)" A variety of user-generated media platforms relevant to business context and entrepreneurial communication were included: micro-blogging site Twitter (Fischer & Reuber, 2011), business networking site LinkedIn (O'Murchu, Breslin, & Decker, 2004), mobile learning platform podcasts (Boulos, Maramba, & Wheeler, 2006), online forum Reddit (Mack, Marie-Pierre, & Redican, 2017), blogs (Shao, 2009), collaborative projects Wikipedia (Shao, 2009), private social networking site Facebook (Smith et al., 2012), video-based content community YouTube (Culnan, McHugh, & Zubillaga, 2010), and other. If participants selected "other," they were asked to write down the name of the media channels.

The researcher composed the intensiveness of media use based on the daily use across all the platforms. “Never” answers were dropped, and responses marked “less than once a month” were taken as once per 60 days. For example, N_2 referred to the total number of media used less than once a month by an individual. In short, media use was calculated by summing the frequencies of all media used. The formula is

$$\text{Media use} = N_2/60 + N_3/30 + N_4/7 + N_5/1$$

Knowledge network engagement. Participants were asked the question “How frequently do you engage with the following sources to seek support for your entrepreneurial endeavor? (1=Never, 2=Less than once a month, 3=Monthly, 4=Weekly, 5=Daily).” There were 10 categories of information sources listed including friends, customers, investors, other entrepreneurs, consultants, mentors or advisors, academic institutions, members of professional networks (e.g. conferences), generally available books and reports, and other. Participants could also specify other sources that are not included in the survey. This measure was adapted from the knowledge contact networks of Huggins and Johnston (2010) as well as the sources of innovation items used by Weterings and Boschma (2009). The formula for composing a total score was the same as for intensiveness of media use.

$$\text{Knowledge network engagement} = N_2/60 + N_3/30 + N_4/7 + N_5/1$$

Knowledge explicitness. There were two questions included for this variable. Participants were first asked “When you receive the following types of information for your startup, was the information sufficiently explained to you in the text-based format (e.g. reports, emails, messages)? (1= Not at all, 2= Mostly not explained, 3= Somewhat, 4= Mostly explained, 5= Explained clearly).” Then the second item asked about “When you received the following types of information for your startup, how easy was the documentation to understand?” Respondents

were asked to rate each of the source on a five-point scale, ranging from "not easy at all" (1), to "very easy" (5). The types of information included 6 items about entrepreneurial knowledge, which are 1=Finance, 2= Hiring and collaboration, 3= R&D and technology, 4= Market conditions, 5= Management practices, 6= Career-related. The ratings were aggregated to a composite score as the variable knowledge explicitness for statistical analysis.

Control variables. Three socio-demographic variables were included as control variables in the analysis: gender, age, education and funding level. Gender was included following prior studies on the impact of gender in forming knowledge networks (Griffith & Neale, 2001). Gender was coded 1 through 3, where female = 1, male = 2, and non-binary/third gender = 3. Age was included as a control variable because studies shown that age influences the use of communication channels in organizational settings (Wilson et al., 2008). Entrepreneurs' ages are coded 1 through 5, corresponding with the following brackets: ages 18- 25, 26-35, 36-45, 46-64, and 65 and above. Education was controlled in this study since education impacts the likelihood that someone will engage in knowledge sharing activities (Duarte & Snyder, 2006). Education levels were coded 1 through 5, from "Some high school education" to "PhD, MD, or other advanced degree." In addition to socio-demographic variables, organizational size and total capital raised to date were included as control variables. Organizational size measures the number of full-time employees including the participant him/her self. It ranges from "1-4" to "50 or more." Total capital raised capture five different funding levels from "Less than $10,000" to "$1 million or more."

Table 4

Variable Description for the Second Research Component

Variable	Description
Perceived knowledge access	The average perceived easiness of knowledge access across six areas: finance, hiring and partnership, R&D and technology, market conditions, management practices, and career-related issues.
Breadth of experience	The areas of experiences in total, including industry experience, startup experience, senior management experience, functional experience in R&D, marketing & sales, and finance.
Relatedness of experience	1). The extent to which entrepreneurs' present company operates in the same or very similar industry. 2). The extent to which entrepreneurs' present company uses the same or very similar business approach.
Media use	The frequency of media use, including Facebook, Twitter, LinkedIn, podcast, Reddit, YouTube, Blog, and Wikipedia.
Knowledge network engagement	The frequency of network engagement, including with friends, investors, customers, other entrepreneurs, mentors or advisors, consultants, members of professional associations, academic institutions, and generally available reports or books.
Knowledge explicitness	The extent to which the knowledge is sufficiently codified across six areas: finance, hiring and partnership, R&D and technology, market conditions, management practices, and career-related issues.
Socio-demographic variables	Entrepreneur's age, gender, education and ethnicity.
Business characteristics variables	Startup's total number of full-time employees and the total capital raised from external sources.

Knowledge acquisition. Knowledge acquisition was calculated as an average of four questions, with each of them assessed on a 5-point Likert scale (from 1=strongly disagree to 5= strongly agree). This measure was adopted from the satisfaction with knowledge transfer measure from Leonardi and Meyer (2015) as well as the knowledge seeker-reported usefulness of Levin and Cross (2004). This question asked entrepreneurs to indicate the degree to which he

or she (a) felt the knowledge received was what he or she was looking for, (b) felt the knowledge source was a good person to ask for the knowledge, (c) felt the knowledge was useful, and (d) felt the knowledge improved the quality of his or her work. Based on the study of Leonardi and Meyer (2015), these four items were well aligned with a Cornbach's α of .91.

Media multiplexity. Media multiplexity assessed the extent to which entrepreneurs use multiple media channels for engaging with mentors. This measure was adapted from the media channels in the work of Haythornthwaite (2005) as well as the media relevant to interpersonal communication in business context (Baym et al., 2004; Scott & Timmerman, 2005). Participants were asked to respond to the question "What media do you usually use to interact with your mentor or knowledge source?" The media platforms include face-to-face meetings, video chat (e.g. Skype), phone calls, emails, social media (e.g. Twitter), instant/text messaging (e.g. WhatsApp), collaboration tool (e.g. Slack) and other. If participants selected "other," they were asked to write down the name of the channels. The number of channels were aggregated to a composite score as a count variable for statistical analysis.

Relational multiplexity. Knowledge complexity measured the range of knowledge shared between mentor and early stage entrepreneurs. Participants were asked "What types of resources have you gained accessed to as a result of your relationship with this mentor/knowledge source?" The six answer choices included social support, career advice, specific business skills, referral to other contacts or exposure to other resources, general information about the business environment as well as investment. The first five items were adapted from prior study on entrepreneurial mentoring functions: psychosocial support (Gist & Mitchell, 1992), career development (Eesley & Wang, 2017), skill enhancement (Baron, 1998), resource broker (Kenney & Goe, 2004), and socialization to the field (Ding & Choi, 2011). In addition, the researcher

included an emerging mentorship function, namely providing investment directly or indirectly for new venture support (Dowejko & Chan, 2018). The number of knowledge types were aggregated to a composite score for statistical analysis.

Tie strength. Tie strengths reflected the perceived closeness between early stage entrepreneurs and their mentors (James, 2000). Tie strength was assessed as the average of emotional closeness and communication frequency, consistent with previous work of Reagans and McEvily (2003) and Hansen (1999). Participants scored the following two statements on a 5-point Likert scale: "I communicated frequently with this mentor/knowledge source" and "I had a close social relationship with this mentor/knowledge source." (ranging from 1= strongly disagree to 5= strongly agree).

Trust. Trust has been suggested as a critical factor to information exchange, reciprocity of influence, and joint problem solving (Zand, 1972). This measure adopted the four-item benevolence-based trust scale used by Johnson et al. (1996), similar to those used by Mayer and Davis (1999) and Levin and Cross (2004). This measure included: 1= I assume that he or she would always look out for my interest, 2= I assume that he or she would go out of his or her way to make sure I was not damaged or harmed, 3= I feel like he or she cares about what happens to me, and 4= I feel like he or she is on my side. All of these four items are assessed using a 5-point Likert scale (ranging from 1= Strongly Disagree to 5= Strongly Agree).

Perceived value. Perceived value was adapted from the competence-based trust scale used by Levin and Cross (2004) and the credibility-based trust scale developed by Johnson et al. (1996). This measure includes: 1= I know that he or she is capable and competent, 2= He or she is always frank and truthful in its dealings with us, 3= He or she is very knowledgeable about the things relevant to my startup, and 4= Advice given by this person is reliable. All of these four

items are assessed using a 5-point Likert scale (ranging from 1= Strongly Disagree to 5= Strongly Agree).

Social embeddedness. Social embeddedness measured whether the entrepreneurs and their mentors have common friends, affiliated with common professional associations, from the same academic institutions, worked for the same employer, and they are now in the same industry. This measure was adapted from the work of Aral and Walker (2014) and Easley and Kleinberg (2010). Respondents are asked to answer Yes or No to five statements such as "My mentor and I have common friends" and "My mentor and I are from the same academic institutions." The number of Yes answers were aggregated to a composite score for statistical analysis.

Spatial proximity. Spatial proximity asked about the physical location of the mentor in four spatial categories: same city; same region but different city (within a one-hour drive); different region but within the same country; and different country. This measure was similar to the measure of spatial proximity of investors and investments by Fritsch and Schilder (2008) and the measure of spatial proximity between software firms and customers by Weterings and Boschma (2009). The one-hour drive boundary corresponds to the critical distance for Silicon Valley VC investments (Zook, 2002) and the region where most of the entrepreneurs' daily activity takes place (Stam, 2007).

Age dissimilarity. Mentor age groups were coded as 1 through 5, representing 18-25, 26-35, 36-45, 46-64, and 65 or older. In order to create a composite score of age similarity, the researcher first computed the median in each age group, for example, 21.5 for age 18-25 or 55 for age 46-64. Then the absolute number of the difference between entrepreneur's age and the

mentor's age median was determined. Finally, the ratio of these two numbers was used as the measurement of age dissimilarity.

Gender dissimilarity. Respondents were asked to report whether they had the same gender as their mentor, with 1=yes, 2=no, and 3= not sure. Gender composition was created with a dummy-coded variable with "1" representing homogeneous gender dyads and "2" representing heterogenous gender dyads.

Ethnicity dissimilarity. The racial categories of entrepreneurs was broadly grouped into African American ("Black"), Asian, Hispanic, and White. Ethnic composition was studied with a dummy-coded variable with "1" representing homogeneous ethnic groups and "2" representing heterogenous age groups.

Control variables. Three socio-demographic variables and two business characteristic variables were included as control variables in the analysis: gender, age, education, ethnicity, organizational size and total capital.

Table 5

Variable Description for the Third Research Component

Variable	Description
Knowledge acquisition	The perceived effectiveness of knowledge acquisition when interacting with mentors. It includes (a) felt the knowledge received was what he or she was looking for, (b) felt the knowledge source was a good person to ask for the knowledge, (c) felt the knowledge was useful, and (d) felt the knowledge improved the quality of his or her work.
Media multiplexity	The extent to which entrepreneurs use multiple media channels for engaging with mentors. The media platforms include face-to-face meetings, video chat, phone calls, emails, social media, instant/text messaging, collaboration tool and other.
Relational multiplexity	The extent to which entrepreneurs obtain different types of resources from the mentors. It includes social support, career advice, specific business skills, referral to other contacts or exposure to other resources, general information about the business environment as well as investment.
Tie strength	The perceived closeness between entrepreneurs and their mentors. It includes (a) I communicated frequently with this person, (b) I had a close social relationship with this person.
Relational trust	Relational trust measure includes (a) I assume that he or she would always look out for my interest, (b) I assume that he or she would go out of his or her way to make sure I was not damaged or harmed, (c) I feel like he or she cares about what happens to me, and (d) I feel like he or she is on my side.
Perceived value	Entrepreneurs' perceived value of their mentors. It includes (a) I know that he or she is capable and competent, (b) He or she is always frank and truthful in its dealings with us, (c) He or she is very knowledgeable about the things relevant to my startup, and (d) Advice given by this person is reliable.
Social embeddedness	The total number of overlapping social circles between entrepreneurs and their mentors.
Spatial proximity	The physical distance between entrepreneurs and mentors.
Interpersonal dissimilarities	Difference in gender, age, and ethnicity between mentors and entrepreneurs

Analysis. Prior to analysis, data were examined using SPSS V22.0 software (IBM Corp, 2013) for accuracy of data entry, missing values, and fit between their distributions and the assumptions of multivariate analysis. Data were screened first to verify the accuracy of data and to ensure that key statistical assumptions were met. The researcher inspected histograms across all the variables to see if distributions made sense. Little (1988)'s missing completely at random (MCAR) test was used to check whether or not the pattern of missing values is dependent on the data values. The expectation-maximization (EM) algorithm (Allison, 2002) shows that *p*-value is higher than .05, suggesting that the missing data occur at random. Using Mahalanobis (1936)'s distance with $p < .001$, no case was identified as multivariate outlier.

Most of the variables were confirmed to be normally distributed by conducting z tests of skewness and kurtosis appropriate for the sample size (Kim, 2013). A log transformation was used for the highly skewed variables, which resulted in approximately normal skewness and kurtosis. This study did not use mean centering as there is some controversy as to the impact of mean centering on the measures of multicollinearity (Iacobucci, Schneider, Popovich, & Bakamitsos, 2016; Shieh, 2011). Further, the researcher confirmed that all variables have tolerance values higher than .20, a null result for multicollinearity (Grapentine, 1997; Tabachnick, Fidell, & Osterlind, 2001). Multicollinearity was also checked by looking at the correlations between variables and linearity was confirmed with the predicted-value-residual scatterplot. The bivariate correlations of all the variables in this model were calculated (see Appendix A).

Independent sample t-test. In the survey questionnaires, participants were asked to check whether they have startup experience prior to their current business. This study used the independent sample t-test to compare the means of two independent groups, people with startup

experience and without startup experience, to determine whether there is statistical evidence that the means are significantly different. Levene's test was used to examine the homogeneity of variance, which is an assumption for independent sample t-test (Levene, 1961). When equal variances are assumed, the calculation uses pooled variances; when equal variances cannot be assumed, the calculation utilizes un-pooled variances and a correlation to the degrees of freedom.

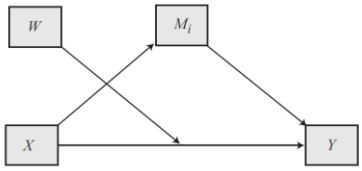
One-way ANOVA. This study used a one-way ANOVA to test whether there was a difference in average engagement behaviors among groups of people who have mentor, who don't have mentor, or who are not sure about whether they have mentor. The null hypothesis for an ANOVA is that there is no statistically significant difference among the groups. If the *p*-value associated with the *F*-ratio is smaller than .05, then the null hypothesis is rejected, which means that the means of all the groups are not equal (Cardinal & Aitken, 2013). A Tukey test was used as the post hoc test to determine where the group difference lay.

Conditional process modeling. Moderated mediation models aim to explain both how and under what conditions a given effect occurs and whether the strength of an indirect effects depends on the level of the moderator (Schuck & de Vreese, 2012). Conditional process modeling was used to examine whether or not the mediating link between prior experience and knowledge access is conditioned by a moderating variable knowledge explicitness. The SPSS PROCESS macro (Hayes, 2015, 2018) helps test the model that includes the direct and indirect effect of prior experience on knowledge access. The second research component used Hayes's Model #5 in testing the moderated mediation[2]. The third component used Hayes's Model #4 to examine whether tie strength mediates the relationship between media multiplexity and knowledge acquisition.

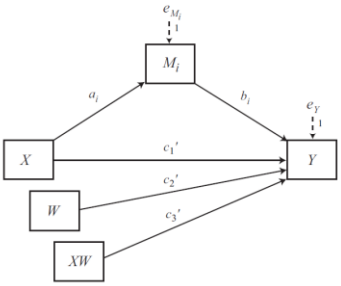
[2] Model 5 and Model 4 are statistical models in the PROCESS program for SPSS

Bootstrapping is a nonparametric resampling procedure to obtain confidence limits to assess the significance of conditional indirect effect (Preacher & Hayes, 2004). The bootstrapping function in PROCESS helps generate a confidence interval around the indirect effect. 5,000 re-samples of the data were drawn at a 95% confidence interval to estimate the hypothesized effects. If the interval does not include zero, the effect significantly differs from zero in a standard two-tailed test (Schuck & de Vreese, 2012). *Figure 13*(a) and (b) illustrates the conceptual diagrams and statistical diagrams for Model #5 and Model #4 respectively.

(a)



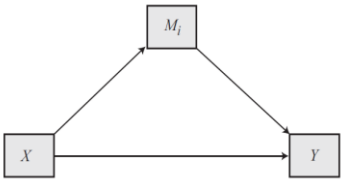
Conceptual Diagram



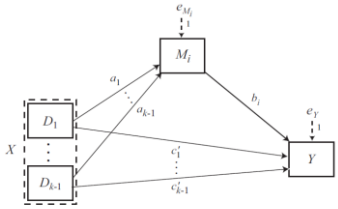
Statistical Diagram

Indirect effect of X on Y through Mi = ai bi. Conditional direct effect of X on Y = c1'+ c3'

(b)



Conceptual Diagram



Statistical Diagram

Relative indirect effect of X on Y through *Mi = ai bi*. Relative indirect effect of *X* on *Y* = c'_1

Figure 13. Conceptual Diagram and Statistical Diagram of Conditional Process Model #5 (a) & Model #4 (b). Adapted from Integrating Mediation and Moderation Analysis: Fundamentals using PROCESS, a short seminar by Hayes, August 2013. Retrieved from http://www.personal.psu.edu/jxb14/M554/specreg/templates.pdf

Sequential multiple regression. Sequential multiple regression is a variant of the basic multiple regression procedure that allows specification of a fixed order of entry for variables in order to control for the effects of covariates or to test the effects of certain predictors independent of the influence of others. To answer the first question, whether media multiplexity predicts relational multiplexity, a sequential multiple regression was performed. In Step 1, the three socio-demographic control variables, gender, age, and education, as well as the two business characteristic control variables were entered to predict dependent variable relational multiplexity. Since these variables might be associated with the way people develop relationships, they were entered first to control their effects. In Step 2, the main construct, media multiplexity, were added to the model. Multicollinearity was checked to confirm the independent effect of each variable in the model (Aiken, West, & Reno, 1991). Similarly, sequential multiple regression was also used to answer the question about the predictors of media multiplexity. The same set of variables was entered in Step 1 and the main constructs, age similarity, gender similarity, ethnicity similarity, proximity, trust, perceived value, and social embeddedness, were added in Step 2.

Open-ended survey question. The answers for the survey question asking about challenges in accessing information were analyzed in Excel in three steps. Firstly, the researcher parsed the text to identify common themes. Secondly, the researcher tagged the themes with different codes to make them searchable and countable. Lastly, the frequency of the themes was calculated and interpreted along with the interview questions and survey results. Table 6 presents a summary of the mixed methods, data sources, and analytical procedures, which are then elaborated below in greater detail.

Table 6

Summary of Research Questions, Data, and Analyses

Topic	Research Questions	Analytical Approach	Key Data
Knowledge ambiguity and coping strategy	RQ1 RQ2	Thematic analysis	Interviews
Prior experience, communication behavior and knowledge access	H_1-H_8	Multivariate regression	Survey
Mentor selection and engagement	RQ3	Thematic analysis	Interviews
Media multiplexity, relational multiplexity and knowledge acquisition	H_9-H_{13}	Hierarchical linear regression	Survey
Predictors of media multiplexity	H_{14}-H_{20}	Hierarchical linear regression	Survey

Chapter 6

Knowledge Ambiguity and Early stage entrepreneurs' Coping Strategies

The goal of the first part of the dissertation was to explore the factors that lead to knowledge ambiguity among early-stage entrepreneurs as well as to understand how they use various online media channels or engage with knowledge sources to cope with the ambiguity of knowledge and the uncertainty in knowledge-seeking. The themes of both of these core questions are discussed in this section based on the textual analysis of the interviews and the learnings gleamed from the observations that were conducted as part of this study.

Sources of Knowledge Ambiguity

In strategic management literature, knowledge ambiguity was used as a way for companies to intentionally increase the stickiness of knowledge to prohibit imitation and protect technological advantage (Reed & DeFillippi, 1990). Communication scholars used knowledge uncertainty to capture the discrepancy between the knowledge desired and the quality of that acquired (Ramirez et al., 2002). Base on prior literature, RQ1 aims to understand what are the factors that lead to knowledge ambiguity and uncertainty in the early entrepreneurial context. Four themes emerged from the interview data as sources of knowledge ambiguity: complexity of knowledge, complexity of roles and responsibilities, environmental factors, and legitimacy as a premise of knowledge transfer. Some of these themes encompass multiple sub-concepts. Interviewees are referred to as E1-E20 in the quotation, corresponding to their participant ID in Table 2.

Complexity of knowledge. Based on the content of the interviews, complexity of knowledge was found to be a multi-faceted construct. Specifically, complexity of knowledge can be analyzed based on the characteristics of the market and industry.

Newness of market. While most prior studies interpret complexity of knowledge as either its hard-to-document nature (Leonardi & Meyer, 2015) or its unclear interdependencies between action and result (Simonin, 1999), data in this dissertation revealed that the newness of market and the hybrid industry format are the key factors resulting in complexity of knowledge among early stage entrepreneurs in the NYC metropolitan area. First, in an emerging field, it is extremely difficult for entrepreneurs to identify the industry norms or best practices to follow as well as to identify the target customers ready to accept the new technology. Entrepreneurs thus spend tremendous time in the early stage focusing on customer discovery and product validation. With limited established industry knowledge, customer feedback is one of the most important sources of knowledge for entrepreneurs to explore market needs and develop viable products. However, the knowledge obtained from customers is usually vague since the information given by the entrepreneur was not clear at the first place. As explained by one participant, the CEO of a digital media company founded in 2017, "It is very hard to talk to initial customers at the beginning when you are developing. If you're creating something entirely new, it is very difficult to get the point across right away" (E10). The newness of market increases the difficulty of framing the new idea, communicating the idea to stakeholders, and receiving specific feedback.

Hybrid industry. The NYC metropolitan market is well known for producing startups that are hybrids of multiple industries. A number of established businesses have collaboratively sponsored coaching programs for hybrid industries. For example, Accenture has partnered with Partnership Fund for NYC to create a fintech Innovation Lab to support entrepreneurs who are developing disruptive enterprise technologies for the financial services sector such as banking and insurance. NYCEDC and Bloomberg also launched a training program ELabNYC for supporting bio & health tech entrepreneurs. Many of these initiatives aim to teach entrepreneurial

business concepts to aspiring tech entrepreneurs so that tech experts can effectively manage products and build organizations. However, the hybrid nature of tech plus X industry increases the complexity of knowledge as they burdened with conflicting priorities and perspectives. The knowledge in this hybrid context requires additional effort from entrepreneurs to bring in stakeholders from both fields to negotiate and co-create shared understanding. The founder of a one-year-old AI-driven drug discovery company remarked that:

> I think you hear a lot from the leaders in the field ... Like, I start feeling this thing where you're merging two fields, like we are inherently a mix of a tech company and a bio company. It's very easy to find opinions from experts in bio, and opinions from experts in tech, but I think that hybrid opinion's kind of mixed. I don't know how this would be possible, but if there's some way to get those two opinions into a room and say, like "Okay, how would you guys combine your two workflows?" Rather than bio trying to just steal stuff from tech, or tech just trying to go into bio, thinking, you know, like, "Okay, how can we take the best of the tech world and the best of the bio world?" (E5)

In the quote above, which is a biotech company, the three pillars that support product innovativeness are pharmaceutical knowledge, engineering knowledge, and biology knowledge. It is important to combine the separate functional foci together to resolve conflicts and improve efficiency. The founder from the above company also described how he always tries to organize teams in a hybrid format: "so we kind of see each team as a one-to-one-to-one ratio, so one drug discovery person, one machine learning person, one computational biologist, and they go work together to solve these problems" (E5). The balance of voices from different fields as well as the involvement of multiple industry norms result in a diversification of the components of knowledge and increase the complexity of knowledge that is required for success. Although such knowledge complexity ultimately creates a barrier to imitation, it demands more resources and iterations during the generation process.

Complexity of roles and responsibilities. Research on knowledge-seeking within organizations argues that hierarchy influences knowledge transfer as low-ranking members tend

to be more accessible (Borgatti & Cross, 2003). The qualitative data suggested that while the role of hierarchy is diminished in entrepreneurial contexts, entrepreneurs' special roles and responsibilities tend to complicate the way they seek knowledge and the way they make sense of the knowledge received. Three sub-concepts were identified from the data: role as founder, tension between short-term need and long-term vision, and tension of information disclosure.

Role as founder. First, as the CEO of the organization, sometimes also as the only employee of the organization, entrepreneurs often experience difficulties in conceptualizing knowledge, identifying the source of knowledge, and making judgment of knowledge due to the responsibilities attached to their organizational roles. For example, when diverse customer feedback exists for multiple prototypes, founders take full responsibility in selecting the right prototype to move forward by combining previous experiences with "gut feeling." When the knowledge-seeking process is coupled with a decision-making process, the founder's dual role exacerbates the stickiness of knowledge. As a founder of a three-month-old digital media startup explained:

> Because you have to use your gut. I'm product manager, so that's where your intuition starts coming into play. And saying, okay, based on the market knowledge that you have, based on the experience that you had as a user, developing your own personal brand assessment to business. So, you're kind of like extrapolating from real customer data, unreal customer data, and then adding your gut feeling, so there's always that feeling of, of doubt. (E10)

Similar to the example above, several other interviewees pointed out how intuition comes into play when they have insufficient time and resources to find the 'best' knowledge. Entrepreneurs tend to adjust their expectations about the knowledge desired to accommodate other business needs. Previous research indicates that the capability of the entrepreneur to value and assimilate knowledge is a key factor of knowledge ambiguity. However, the assumption is based on the availability of knowledge. It neglects the fact that sometimes entrepreneurs have to make

decision about knowledge without sufficient resources for information-seeking. Thus, the role as founder interferes with the entrepreneur's knowledge-seeking process.

Balance of short-term need and long-term vision. Second, as founders in emerging industries, many of the participants expressed the tension between balancing short-term needs and long-term visions of the business. These entrepreneurs constantly situated themselves in the broader social context to evaluate the vision and mission of their businesses. The following conversation was with a female entrepreneur who co-founded an AI device company in 2016. Her company provides residents in senior living facilities with easy access to the outside world using voice-enabled AI devices. She explained:

> We pretty much just look up—there's different innovations in healthcare. Being a company, we aren't really explicitly doing anything in healthcare at this time. But we do have a pathway to go towards healthcare. And we want to do that obviously because of the demographic we work with. How do you leverage technology as a way of changing behavior? As a way of promoting your health and ultimately of living longer. What can you do? … There [are] broader questions I think about all the time, you know. When you have more life behind you and less life ahead of you, where do you find motivation and purpose? Especially in the western society where there's this idea of retirement, and society tells you you're not useful anymore….So those are like, those fundamental questions help a lot actually because then we start taking these big ideas and narrowing it down to see, is there a way that we can use our platform to help solve these problems or make their lives easier? (E13)

The founder's quote above indicated that even though the company's core strength is a technology platform, she and her co-founder always come back to the fundamental questions of healthcare future and societal concerns to inform their knowledge-seeking. The balance of this tension, on one hand, suggests the value of the businesses, but on the other hand, increases knowledge ambiguity as the broader social problems are usually much more complicated than the possible solutions. The context itself generates meaning and impedes the transfer of knowledge (Shariq, 1999; Thompson & Walsham, 2004). Every single innovation in the market

changes the industry landscape and the changing social context increases the stickiness of knowledge.

Tension of information disclosure. In the knowledge-sharing literature, the intention to maintain power within an organization can lead to the withholding of critical knowledge (Brown & Duguid, 2001). Findings from the qualitative portion of this study demonstrate that the fact that entrepreneurs in the nascent stage of development prefer to stay hidden could be the reason that their perception of knowledge is more ambiguous. Entrepreneurs intentionally remain hidden on various online or offline channels for different reasons. One reason for this is that at early stage of development, especially in a highly-competitive environment, they want to protect their ideas from imitation and give more time for product development. When new product development is the organization's lifeblood to drive sales and profits, entrepreneurs may especially value the incubation of new products (Chang, 2014). As said by a student founder, "because this is still like early development business, I don't want many people to know our idea. (E4)"

Another reason that entrepreneurs may obfuscate their identity is that information disclosure on certain sensitive topics may cause negative responses from audiences. One female entrepreneur who was in the process of starting a business in virtual reality commented, "So you never want to advertise that you don't have somebody on your team to build a product. Like I would never tell a VC this" (E7). In an organizational environment marked by increasing scrutiny from media, business analysts, and other external stakeholders such as customers, organizations are vulnerable when communicating externally (Desai, 2017). For example, in the case of that female entrepreneur, she chose not to post information about hiring a technical co-

founder on social media because that information might be interpreted as a signal that the company lacks a technical foundation and therefore cannot compete in the tech industry.

One similarity of both the cases above was that the entrepreneurs were student founders who have not fully developed a product prototype. This nascent stage prior to product launch marks a period demanding resources but also requiring special attention to the way for seeking resources. While withholding information at early stages helps entrepreneurs focus on product development and helps entrepreneurs to avoid others forming negative perceptions, the reduced external communication also increased the level of knowledge ambiguity to some extent as people could not provide timely feedback without open communication.

Environmental Factors. Although the specificity of knowledge in previous literature attends to the contextual factors in affecting the transferability of knowledge, the context could be also examined through a resource dependency perspective or an institutional approach. Resource Dependency Theory is premised on the notion that an organization's ability to manage dependencies on other organizations influences its ability to acquire external resources for survival (Pfeffer & Salancik, 2003). The institutional approach focuses on explaining how social structures, rules and routines provide stability and meaning to social behaviors (Scott, 1995). It was found in the interviews that the cognitive, normative, and regulative structures attached to occupations and institutions serve as barriers for entrepreneurs to effectively interact with external stakeholders and assimilate information.

Occupational Differences. Similar to the fact that internal knowledge transfer is influenced by organizational factors such as functional diversity (Weber & Kim, 2015), inter-organizational knowledge transfer is also affected by occupational differences. For example, almost half of the respondents pointed out the knowledge ambiguity and uncertainty associated

with their communication with investors. Securing funding is not a straightforward process. The clarity and timeliness of the information from investors are the main concerns. Previous literature suggested that the lure of business opportunity can tempt entrepreneurs to provide overconfident assessments of their business or other unreliable information in order to secure resources (Stuart & Sorenson, 2005). The information asymmetry between entrepreneurs and investors exists because entrepreneurs have better knowledge of their own capabilities and potential than investors (Amit, Glosten, & Muller, 1990). Both venture capitalists and angel investors spend significant time conducting due diligence of a venture to assess the validity of the information (Sengupta, 2011). Therefore, from investors' perspectives, their priority is to make the most valuable investment given all the asymmetrical information from entrepreneurs and the fierce market competition. For this reason, investors tend to avoid giving straightforward feedback and hint about their investing possibility.

Respondents suggested that the ideas of investors sometimes contradict themselves and that makes entrepreneurs very unsure about their true intentions. Many respondents expressed the frustration about learning the criteria of how investors choose startups to invest in. The long and complicated process of seeking information on investment opportunities caused considerable perceived ambiguity. As explained by the founder of a six-month-old cryptocurrency company:

> You know, making sure people that intend to write checks or invest ... Have them do it in a timely fashion, or give you a decision that says no in a timely fashion so you can move forward. That's basically it, just people that you speak about the opportunity and they're interested, and then they kind of respond to you on their own time, which you could expect, but it can be real frustrating sometimes. (E1)

The different expectations of how to interact and when to give response from the founder's quote above point to the different routines and norms in the investment industry and startups. External forces originated from stakeholders' different institutionalized beliefs affect entrepreneurs'

action. During this adjustment and responding process, the interdependencies increase as do the perception of knowledge ambiguity. In addition, occupational differences between investors and entrepreneurs increased the difficulty of the interpretation of feedback. A founder expressed that he could not get the meaning of feedback directly from the phone conversation with investors. He had to read between the lines and then consult friends or peers to make sense of the advice. The differences between occupations as well as the different goals in a business relationship complicate the knowledge transfer process and increase the level of ambiguity.

Institutional factors. The barriers imposed by institutions such as universities, government, and regional ecosystems have also impeded the transfer of knowledge. For example, the tension between technology and business is a common struggle for entrepreneurs. When people with backgrounds in business serve as CEO, it is very challenging for them to find technical co-founders or engineers. One student founder shared his frustration that there is an institutional block between engineering school and business school in his University in terms of talent/knowledge sharing. The founding team recruited their first engineer by walking into the engineering building to spread the words and attract attention from engineering students. The student founder explained:

> It's like super political. It's like, it's like turf wars. You know? ….. It just feels like-- Yeah. This is the engineering school. I don't want business students over here trying to, you know, diminish whatever I'm doing and the other way around, which is kind of silly because there's so much innovation and power from being able to combine like the strategic thinking of a business school where the execution and building capacity of the engineering school, like you merge those two things, you're going to have innovation at your school. Isn't that what you want? Yeah. But like administratively, people have these silos and rules and regulations and red tape that prevent that from easily happening. (E11)

Based on preceding quotations, feeling of "turf wars" suggested an ownership of knowledge between fields in the broader business environment. One reason causing such ownership of

knowledge might be the socially constructed superiority and priority of certain fields over the other. The academic setting in the above university represents a miniature society with different disciplinary statuses.

Beyond the institutionalized hurdle between fields, in some other cases the barrier of knowledge transfer arises from policy-makers' ignorance of communication needs. Hiring co-founder and early employees were found as the key barrier to growth in the NYC metropolitan area. For example, an entrepreneur in biotech explained that even though there are many talents in this area, it is very hard to find these people and make connections. He proposed a potential solution:

> What would be really helpful is all the students in New York, instead of companies posting jobs and students applying or it, if there was a way for students to be, like ... a centralized New York database, where it's like okay, there's are people who are looking to start a career in the next six to twelve months. Here are their skills, you know, they're just looking at it. And then startup companies or even established companies could go and look, like "Who here should we reach out to?" (E5)

The centralized New York database of talents mentioned by the biotech founder responds to the institutional gap in the market that interferes with knowledge-sharing between entrepreneurs and the market. Without appropriate institutional support, it is difficult for entrepreneurs to identify the source of knowledge and the path to access knowledge.

Founder legitimacy as a premise of knowledge transfer. In the entrepreneurial context, stakeholders' motivation in sharing knowledge is contingent upon the perceived legitimacy of the knowledge seeker. Legitimacy has long been argued as the most significant predictor of resource acquisition and organizational growth (Zimmerman & Zeitz, 2002). For example, audience affirmation is attributed to entrepreneurs' high volume of posts on Twitter signaling quality, distinctiveness, and relational orientation (Fischer & Reuber, 2014). Data in this dissertation suggest that founder legitimacy plays a critical role in influencing a knowledge

source's willingness in sharing information and it complicates the knowledge transfer processes. Since it is hard to evaluate founders' legitimacy in novel industries, knowledge sources including investors, mentors, and peer entrepreneurs all rely on mutual contact to monitor their information disclosure. Such indirect knowledge transfer increases knowledge ambiguity.

Reliance on mutual contact or social affiliation. Within organizations, studies have found that unfamiliarity between colleagues (Hollingshead et al., 2002) as well as tie strength between knowledge seeker and knowledge source (Leonardi & Meyer, 2015) influence knowledge transfer effectiveness. Data in this dissertation demonstrate that in entrepreneurial context, while direct social relationship is less of a prerequisite for accessing desired knowledge, social embeddedness has been given exceptional importance in the knowledge transfer process. Social embeddedness refers to the shared affiliation between entrepreneur and knowledge source such as mutual connections or shared social groups (Lattanzi & Sivakumar, 2009). Shared context warrants the knowledge seeker's qualifications and thus leads to more effective collaboration.

Social networks not only allow knowledge seekers to identify knowledge holders, but also serve as credential evaluation mechanisms for knowledge holders to decide whether to open up the access. Social networks are usually considered as information pipes that connect knowledge seekers and knowledge holders (Podolny, 2001). Indirect ties impact the process of accessing financial capital (Hsu et al., 2007). It is common knowledge among entrepreneurs that investors rely on mutual contacts to determine the necessity of further conversation. Literature also shows that investors are more likely to back an entrepreneur if they share direct or indirect ties as the social connection offers them private information about the capability of the new business (Shane & Cable, 2002). According to a study of university spinoff startups,

entrepreneurs who have connections with angel investors are more likely to attract further attention from other financial providers (Shane & Stuart, 2002). Data from this study also show that finding mutual contacts and asking for a warm introduction has been the industry standard for entrepreneurs to connect with investors. It was also made clear by many investors that mutual contact directly influences the opportunity of the entrepreneur's profile being reviewed. One interviewee shared why he thinks relying on a mutual contact for deciding knowledge transfer could be detrimental for promoting innovation:

> The thing that's worked best for me is just finding someone who they've already invested in and asking for an intro, right? It's an incredibly tedious ... It's not a great process. But it's a pity that's the way it works, because then investment just becomes a bubble with people who just all know each other, rather than really branching out. (E8)

Other than mutual connections, social affiliation with established institutions is another determining factor of knowledge transfer. Affiliating with an incubator program could enhance early-stage entrepreneurs' legitimacy so that they are more likely to convince people to be their mentors. For example, the founder of a digital media company indicated the significance of obtaining credibility from an incubator in order to facilitate the knowledge-seeking process:

> Once you graduate or you go through the process of an incubator, you do have a stamp of credibility at that point before you've gone through the process or like a sort of kind trial you would call it. The mentors are much more likely to help you once you go through an incubator and you have an established company that is looking to benefit. Otherwise, if you're just working on a company, but you have not worked towards or you don't have an incubator backing you, it's a little bit more difficult to get the attention of a mentor. (E10)

As indicated above, access to knowledge is largely determined by intermediaries so that the knowledge transfer process becomes indirect and contingent. Not only does the decision of whether to share knowledge at all depend on mutual contact, but also the quality and quantity of the information shared. Table 7 shows the codes, definitions and exemplary quotes for the sources of knowledge ambiguity.

Table 7

Sources of Knowledge Ambiguity Sample Codes, Definitions, and Exemplary Quotes

Topic	Concept	Sub-concept	Description	Exemplary Quote
Sources of knowledge ambiguity	Complexity of knowledge	Newness of market	Nascent market with limited available norms and practices	*"But if you're creating something new from scratch, yeah, it's like, how do you explain Uber at the beginning? How do you explain Airbnb? At the beginning everybody was thinking, why would people rent their houses, it is hard to visualize that."*
		Hybrid industry	The merge of two or more industries with divergent knowledge base	*"I start feeling this thing where you're merging two fields, like we are inherently a mix of a tech company and a bio company. It's very easy to find opinions from experts in bio, and opinions from experts in tech, but I think that hybrid opinion's kind of mixed."*
	Complexity of roles and responsibilities	Role as founder	The conflicting opinions or uncertainty experienced as the founder of the company	*"Because you have to use your gut. And that's when, I'm product manager, so that's where your intuition starts coming into play. So, you're kind of like extrapolating from real customer data, unreal customer data, and then adding your gut feeling, so there's always that feeling of, of doubt."*
		Short-term goal vs. long-term vision	The influence of long-term vision on short-term focus	*"There's broader questions I think about all the time, you know. How like, you know, how to, when you have more life behind you and less life ahead of you, where do you find motivation and purpose? Especially in the western society where there's this idea of retirement, and society tells you you're not useful anymore."*
		Tension of information disclosure	Founders intentionally withhold information in certain stage	*"So you never want to advertise that you don't have somebody on your team to build a product. Like I would never tell a VC this."*

Table 7 Continued

Sources of Knowledge Ambiguity Sample Codes, Definitions, and Exemplary Quotes

Topic	Concept	Sub-concept	Description	Exemplary Quote
	Environmental factors	Occupational differences	Different conducts or expectations associated with occupations	*"So I mean we got some feedback from the VC around that. It was hard to actually get the VC to tell us what the issue was. We had to almost like read between the lines to figure it out. And then I pitched to some other people who had successes and they gave me that feedback."*
		Institutional factors	The influence of institutional barriers on knowledge-seeking	*"We have to deal with the whole court-wide system is, getting this to be more of a norm that you're going to be able to go to court and say, oh we want to show VR in the courtroom. And instead it's being like oh, that's weird, why do you want to show that?"*
	Legitimacy as a premise of knowledge transfer	Reliance on mutual contact or social affiliation	The reliance of intermediary in connecting knowledge seeker and knowledge source.	*"The thing that's worked best for me is just finding someone who they've already invested in and asking for an intro, right? It's an incredibly tedious ... It's not a great process. But it's a pity that's the way it works, because then investment just becomes a bubble with people who just all know each other, rather than really branching out."*

Entrepreneurs' Coping Strategies for Knowledge Ambiguity

The second research question in this study aims to understand the strategies entrepreneurs use to cope with knowledge ambiguity, specifically with the use of various media channels. Six strategies emerged from the data coding: optimize information relevance, enhance communication efficiency, change in public visibility, increase awareness of knowledge, access to indirect knowledge, and specialization within team.

Optimize information relevance. The fast-growing entrepreneurship ecosystem in the NYC metropolitan area offers a tremendous amount of resources to nurture early-stage entrepreneurs. Entrepreneurs receive information from a wide range of channels, such as formal incubator programs, government reports, offline meetups and workshops, mentors, and other entrepreneurs. However, sometimes it is the very availability of information that causes knowledge ambiguity. Diverse sources of advice could lead to confusion and uncertainty when the entrepreneur must identify the right answer. Data from the open-ended survey question that asked about challenges seeking knowledge (see Figure 14) revealed that the challenge in filtering irrelevant information (23%) closely follows the lack of access to information (26%). Interview data demonstrated that entrepreneurs used social media in different ways to better distill information, including building common ground for meaningful dialogue with stakeholders, accessing contextual knowledge to facilitate decision-making, and using community-oriented platforms to promote knowledge exchange.

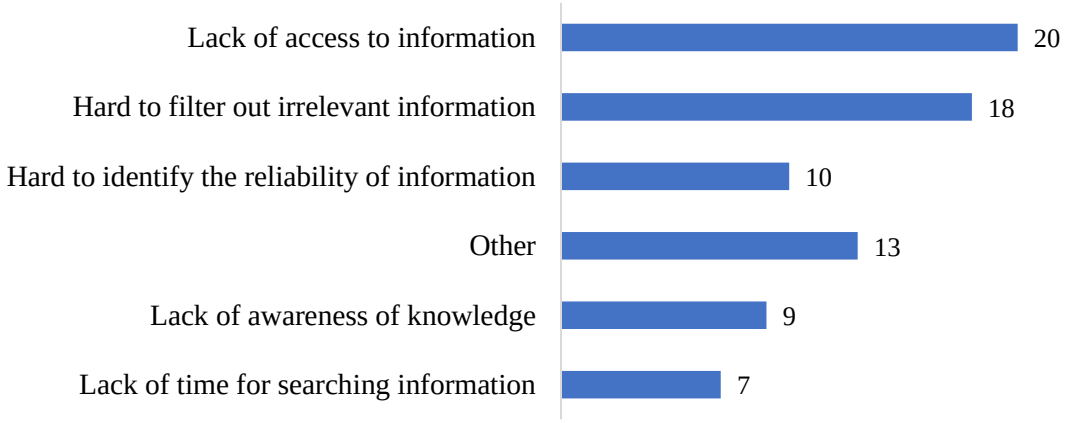


Figure 14. Frequency Table of the Open-ended Survey Question "What is the biggest challenge you face when you are trying to access the information you need?" *(n=77)*

Social media for building common ground. Leonardi and Meyer (2015) note that the time before knowledge transfer is critical in preparing the knowledge seeker to alleviate ambiguity. A knowledge seeker can strategically use the period between the moment when he or she has the need for knowledge and the time of posing the request to better understand the knowledge source and the knowledge itself. The possession of conversational materials will increase the quality and relevance of the questions asked as well as enhance the absorptive capacity of the knowledge seeker (Szulanski, 1996).

Data in this study confirm that entrepreneurs use social networking sites or other user-generated media to gather information that can contribute to better knowledge-seeking efficiency, such as how, when, and in what way to ask for the desired knowledge (Leonardi & Meyer, 2015). Entrepreneurs can see the topics relevant to the interests of their potential investors or mentors on social networking sites and observe their interactions with the content and audiences. Social networking sites offer a channel for entrepreneurs to access their stakeholders and in turn both share updates for stakeholders and consume content produced by

stakeholders (Ellison & boyd, 2013). A founder noted how he indirectly engage with a mentor by tracking his mentor's social media updates,

> I see a lot of times he'll post new methods that he finds interesting. I'll read those and then I'll email him and be like "Okay, I saw you've been interested in these couple of things. Do you think we can take approaches from this article you tweeted back to our internal" So it's more just like ... Rather than directly engaging, how can I use Twitter as a way to figure out where both of us interests are going. (E19)

This respondent is the founder of an AI company started in 2017 and he uses Twitter to build common ground and mutual understanding with his mentor. Twitter offers entrepreneurs conversational material that lubricates the transfer of ambiguous knowledge and strengthens the social relationship with their stakeholders. Through observing his mentor's posts on Twitter, this informant gathered relevant personal and contextual information to make sense of the content shared. Consistent with the findings of Leonardi and Meyer (2015) and Thompson (2008), data in this research show that entrepreneurs need to connect the bits and pieces of information and extract useful information from mundane updates to create ambient awareness and conceptualize others' worldviews.

The increased awareness of knowledge helps the founder decide how to follow-up with the topic -- for example, when to switch to more direct and private communication (email) to brainstorm the solutions. This kind of indirect engagement is particularly useful for an emerging industry with high level of knowledge ambiguity. By virtue of aggregating multilayered communication activity, social networking sites enable the entrepreneur to formulate relevant question without specific awareness of knowledge needs. Consequently, social networking sites like Twitter facilitate the evaluation of information and open up new opportunities for entrepreneurs to identify gaps in knowledge.

Social media for accessing contextual knowledge. While most of the entrepreneurs interviewed try to increase information exposure in order to access diverse ideas, many engaged in creative tactics to contextualize information for optimizing relevance and facilitating decision-making. A common approach is to leverage the content and audience on user-generated media to quickly understand the significance and context of certain information.

The founder of a cryptocurrency company established in 2018 expressed the difficulties in finding information in his industry as cryptocurrency has just started to grow rapidly since 2017. He used Twitter as a news outlet to understand the business environment and identify the logical connections among information. When breaking news happens in the fintech industry, he would not go to Google to search the news; instead, he went to Twitter as it gave richer context about the news which helps him reach conclusions faster. He explained this as follows:

> Twitter is probably my favorite tool. Engagement is not the greatest. It's not really a great place to talk to people, but it's a great place to hear what people are saying because they just share it out all the time. And breaking news. Sometimes I hear something that happened. I don't go to Google first. I'll just go on Twitter and search a term and see what people are tweeting about. I just feel like it's more real time, and there's context, too. You know? I could go on Google and I could search something and then I could see an article, but it would just be based on what, I guess, that publication's biases or style is. Twitter, I could just see all the publications that wrote about something but also what people are saying about it. So I can get to, I would say, somewhat of a conclusion quicker. (E1)

In a new technology industry, there is very limited available information that can be found via-traditional channels such as journals or other formal news channels. Another entrepreneur, also in the cryptocurrency industry, assembled information from many self-described “weird” places in the process of identifying a market gap and forming the current business. For example, he used Reddit to learn about the sentiment in the industry and engage with the technology communities. Although social media provides publicly accessible data, the amount of information sometimes overwhelmed entrepreneurs’ capacities in extrapolating meaning

conclusion from the data. Thus, this entrepreneur used Twitter in a novel way to extract related information from thought leaders' tweets and connect the dots to assist interpretation:

> I would look for thought leaders in the industry that I knew. So like Vitalik Buterin was the founder of Ethereum. I literally wrote the script in R to pull all of his tweets. And then like filtered based on information that I thought. Like, for example, one of the things I was writing about was this specific event that happened in the lifetime of the Ethereum. It's called the hard fork of the DAO. That's not relevant other than that. I downloaded all these tweets and then I filtered on like DAO and I filtered on like this so it's just like oh, here are the 12 tweets that Vitalik thinks about or Vitalik publicly stated related to his own project, related to this exact thing, and then help me, like connect the dots between, you know, what he was doing. (E11)

From the comment above, we can see that by pulling twitter posts using the R programming language, this entrepreneur reorganized the information on social media in a way to better make sense of the scattered information. Thus, he could use the contextual knowledge about people's opinions and attention to understand their behaviors.

Community-based media use. Abundant literature on homophily has addressed how demographic factors such as age, gender, race, education, occupation, and values influence network formation in communities, voluntary organizations, and private businesses (McPherson et al., 2001; Ruef et al., 2003; Yuan & Gay, 2006). Data in this study show that the way entrepreneurs use social media for optimizing information relevance corresponds to the homophily theory. Entrepreneurs are more motivated to engage in social interaction and share knowledge in community-based chatgroups on various media platforms since homophily provides a shared language which not only informs the way they interpret, understand and respond to information but also their attitudes and beliefs (Mesch & Talmud, 2006; Rhodes, 1983; Zenger & Lawrence, 1989).

Several respondents highlighted that demographic similarity is the main reason to join community-based media channels. This is especially true for certain underrepresented social

groups in the entrepreneurship ecosystem in the area, including black entrepreneurs and female entrepreneurs. For example, one of the black entrepreneurs demonstrated how he relies on GroupMe, a popular group messaging app that enables members to make groups of any size and share photos, videos, locations, create events, etc. to participate in the black community:

> This is GroupMe. The group is called Blacks in Tech. This is the group where I got my first customers who are not my friends. And look how many members. There are 1,300 people in this group. Blacks in Tech is a group that helps people who talk about all the different things in the tech community and share our knowledge. So every day we're talking about different things in tech in the black community. People talk about struggles they have in tech, promote work, launching a startup, they'll put it in there. (E8)

The founder quoted indicated that GroupMe offered him not only information about operating a business but also business opportunities. The similarity in ethnicity and the awareness that their ethnic groups are a minority in the field increases the level of trust and cohesiveness. Through involving in community discussion, entrepreneurs are more likely to obtain relevant knowledge matching their demographic background.

Another reason to adopt community-based media channels is because of industry needs. For example, one blockchain entrepreneur mentioned that "There's an app called Telegram, which is like WhatsApp. I joined a Telegram group that's around a certain product, and then I can just follow the information they have there and just keep up with it." Telegram is a cloud-based instant messaging app famous for its end-to-end encryption, leaving no trace on the company's servers, and allows security checks on communication (Hamburger, 2014). Telegram channels accommodate an unlimited number of users. Starting in Russia in 2013, Telegram has been widely adopted in bitcoin, blockchain, and cryptocurrency communities. Many news sites and cryptocurrency traders choose to create broadcast group to share news to Telegram users. For example, *Figure 15* shows a screenshot of some of the top Telegram groups, which tracks

1888 top crypto-related subgroups with a total of 1.9 million members (Telegramcryptogroups, 2018).

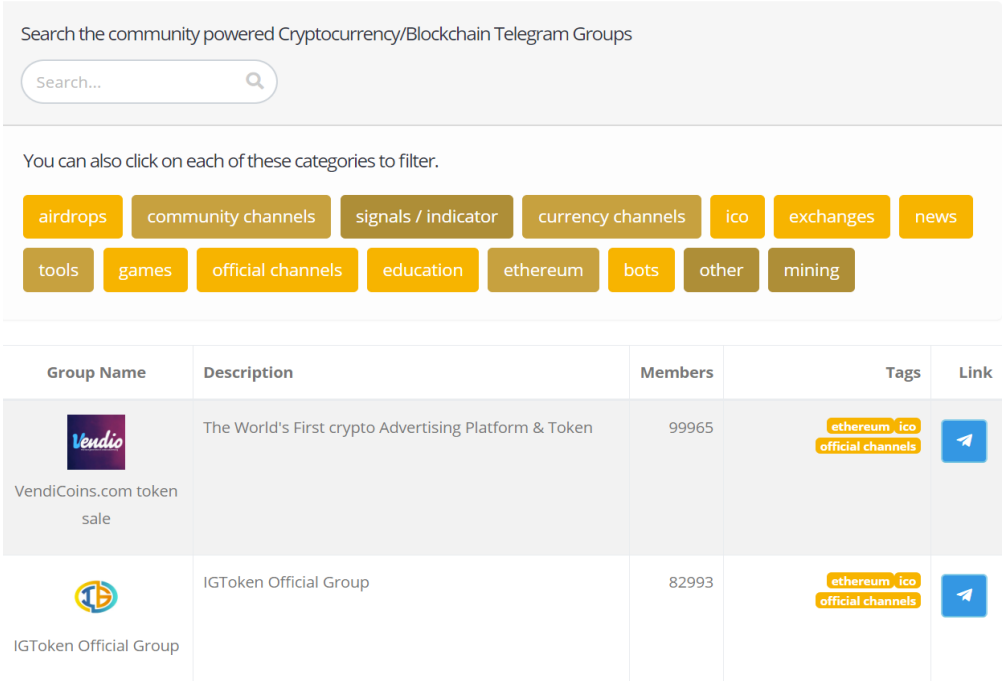


Figure 15. Sample Web-page of Telegram Crypto Groups

A similar functional background coupled with a shared understanding of industry rules and trends helps contextualize the information. Similar interpretations of information will increase the depth of knowledge (Krackhardt, Nohria, & Eccles, 1992). Similarity also provides opportunities for mutual exposure. People receive validation from partners with similar interests when participating in the same activities (Aboud & Mendelson, 1996). Overall, community-based media use helps filter out irrelevant information, facilitates collective interpretation of information, and promotes entrepreneurs' confidence and identity development in the field.

Enhance communication efficiency. Much of the research on media use has focused on differentiating media based on their ability to transmit information relative to a face-to-face encounter (Haythornthwaite, 1996). Compared to a face-to-face meeting, communication via media falls short of retaining the nuances of verbal communication and conveying non-verbal

cues, which blur the information about gender, status, identity or other communication contexts (Culnan & Markus, 1987). The lack of cues may make a medium less effective in facilitating communication that is socially sensitive, intellectually challenging, or that involves negotiation, clarification, and team collaboration (Fish, Kraut, Root, & Rice, 1993; Sproull et al., 1992). Despite the information loss, research shows that mediated communication actually helps overcome physical and temporal constraints (Haythornthwaite, Wellman, & Mantei, 1995) as well as takes communicators from 'being there' (Brittan, 1992) to 'beyond being there' (Hollan & Stornetta, 1992). Data in this dissertation suggest that entrepreneurs tend to strategically compose a portfolio of media tools to leverage the strength of each media in information offering. Entrepreneurs view face-to-face communication as the most effective channel for idea generation and interest alignment, but simultaneously they rely on mediated channels such as video chat and email to complement the knowledge-seeking processes. Different channels are prioritized in their ability to maximize the quality and quantity of the knowledge exchanged.

Physical presence for building mutual understanding. Social presence theory suggests that face-to-face communication is preferred to mediated tools when dealing with ambiguous information or when there is a desire to establish consensus (Sproull et al., 1992). Data collected herein confirm the emphasis entrepreneurs place on face-to-face communication for its flexibility in proposing alternatives, brainstorming new ideas, and managing the pace of information exchange. In high-tech industries where innovation is the key to achieve competitive advantage, entrepreneurs often need to co-create knowledge with stakeholders. A face-to-face meeting allows communication partners to brainstorm together and explore alternatives without giving each other a feeling of disrespect or misunderstanding. For example, one respondent remarked that "during face-to-face meeting where we'll just have a whiteboard, we'll be like 'this is the

way it currently works,' and he's like 'try this, try this, try this.'(E19)" Entrepreneurs can thus devote attention to obtaining the desired information rather than being distracted by guessing the motivation of the knowledge source.

In addition, when knowledge is not well-documented it requires that both parties take more procedures to identify what is the relevant knowledge and how to access the specific information. In this context, physical presence reduces the perceived complexity of knowledge and drives the depth of conversation. For example, a founder of a biotech company gave an example of the possibilities enabled by face-to-face communication:

> When we're on email and the phone, a lot of the times what we talk about is just like "Oh, what would be helpful, where are you guys going?" And when we meet face-to-face, it's kinda like "Okay, we've discussed over the past three months, these would be helpful. So now let's get those done." Like, it would be helpful to get a connection to the FDA, who should we contact next? It would be helpful to discuss collaborating in pancreatic cancer, maybe let's go through all your pancreatic cancer projects and figure out where we could help the most. (E5)

Physical presence also provides a conducive social environment for entrepreneurs to involve multiple stakeholders together in discussion to establish consensus. In a nascent market or a hybrid industry, conflicting opinions and attitudes among stakeholders constitute one of the key factors leading to knowledge ambiguity. When multiple communication partners are not familiar with each other, it is extremely valuable to use face-to-face meetings to develop trust and build relationship. An example of using face-to-face meeting to get buy-in from multiple stakeholders is as follows:

> It's also when we meet, we meet in his offices, so there's a much bigger team, so I usually will meet with his Director of Operations, his Director of Scientific Research, we'll all just sit together and we're like "Okay, let's figure out the best way forward." (E5)

The ambiguity of feedback was mentioned as a reason that slows down the product development process. People give ambiguous feedback either because they are not sure about the answer or

they want to attend to the social relationship and thus choose to attenuate the intensity of the feedback. For example, a three-year-old fintech startup founder commented that, "If I want to hear or feel on a more motive level, then I absolutely want a meeting. I want to look him in the eye and I want to see what his response is" (E2). This founder highlighted the importance of reading facial expressions, gestures, and emotional responses when communicating with stakeholders. Such subtlety of information processing could easily get lost in mediated environment where social cues are hidden. In face-to-face meetings, entrepreneurs are more likely to detect the real emotions from customers, investors, or mentors.

Finally, physical presence also reduces the perception of time constraint. One founder expressed the idea that an in-person meeting can give the feeling that they have more time to talk and engage. To the contrary, he perceived that others are busier and less flexible during phone conversations: "When you're in person there's this feeling that there's more time so like if you're on the phone with someone I feel like people are less likely to take the full amount of time to discuss something" (E20). The perceived flexibility of communication in face-to-face context allows more opportunities for knowledge transfer.

Visual cues for facilitating interpretation. The significance of visual cues on decision making was widely discussed during the interviews. Due to the differences between roles and occupations, on many occasions, people will not articulate their feelings directly and this leads to tremendous uncertainty for entrepreneurs. One E-Commerce company founder interviewed described how his team quickly understands the result of a pitch based on reading the emotional reaction of a potential investor:

> We had a potential investor in France. Obviously, we weren't going to fly to France, but we got on a video conference with him, and actually I couldn't tell, because I was so into the pitch, but my business partner could tell. He could see it in the guy's face. He's like I know exactly when we lost him. (E2)

The preceding quotes show that visual cues are important in knowing the reactions of the audiences and giving them the first-hand information about the results of their efforts. Due to time limitations, entrepreneurs need to predict the potential response of investors and allocate efforts accordingly. Therefore, visual cues help facilitate decision-making and manage entrepreneurs' expectations.

Extensive information offering for agenda building. It is a common practice among the people interviewed to increase communication efficiency by building an agenda with thorough information. Although entrepreneurs put the highest weight on face-to-face communication to generate most useful knowledge, they strategically combined other communication channels such as email to ensure the necessity of in-person meetings and also build an agenda for it. The following quote gives an example of how an entrepreneur prioritized the significance of various media channels:

> Then email is anything that's a little bit more verbose. So … I don't call a meeting unless I know that I actually need to meet, because meetings take time. Usually if I can cover it in an email, this longer form, I'll put everything that I need in the email and let them decide if they want a face-to-face. Then that gives [stakeholder] them the opportunity to respond. I'm very detailed in my emails almost to a fault, because sometimes I'd like to put in all the information the person is going to need in order to help me. At the end of the day I don't want them to have to dig for anything, because that requires work on their part. So, if I give them what they need in an email, then I've done most of the work for them already and they can just respond. In an email I'll always say if you're free to meet, I'd love to meet, but if not, here's information. (E2)

The clarity of information received is based on sufficient information given. Email communication, benefiting from its documentation function, enhances the accuracy of knowledge as well as serves to aid effective allocation, storage and retrieval of information. The above-mentioned founder's extensive information-sharing via email is not intended to replace a face-to-face meeting, but to increase the opportunity of receiving feedback altogether. This

strategy is consistent with the channel complementary theory that the increased use of one channel is associated with the increased use of other available channels (Dutta-Bergman, 2004). Mediated-communication helps entrepreneurs provide a more comprehensive overview of the knowledge needed and lets knowledge sources take initiative in deciding how to advance the conversation.

Change in public visibility. In prior literature, knowledge search and knowledge access are considered as two separate steps. Knowledge search addresses how entrepreneurs identify knowledge sources in the business environment, for example, who are the people with the desired skills and where to find the people possessing similar experiential knowledge. Knowledge access refers to the processes in building a knowledge transfer relationship between knowledge seekers and knowledge sources (Clough et al., 2018). Having identified desired knowledge sources, entrepreneurs need to then attract their attention to promote the merits of their new venture and to convince them to support it. For example, knowledge access includes the process of recruiting technical talent to join the new business, persuading larger companies to form partnerships with the new business, and convincing investors of the new venture's potential.

In a nascent market, however, the information about who the knowledge sources are and where are they located is extremely ambiguous. Data collected in this study show that entrepreneurs tend to change public visibility to enhance the efficiency of the search and access processes. Some of the entrepreneurs also increased public presence to reverse the knowledge searching process. As explained by one cryptocurrency founder:

> Thought leadership helps. LinkedIn helps with thought leadership, so I try to post. I try to post a piece of content at least once a day. So that helps. And then you can connect with people that they could be a guest on my podcast, or it could be something that I write an article on. Sometimes it's somebody that could be a potential member of your team.

> Obviously, it's somebody ... Or it could be somebody that could be a potential investor. (E1)

Cryptocurrency is a latent industry in late 2017 catapulted by the surging price of bitcoin so that the availability of information on where the knowledge is located is limited in this industry. The founder quoted above shows how the user-generated content on social media is used to first increase awareness among the broad audiences and then attract the attention of the knowledge sources to advance the communication. In addition to online branding and thought leadership, increase public presence in offline activities such as meetups or conferences also offers opportunities for both knowledge seekers and sources to connect. One 42-year-old founder who participated in many public pitches said that "you never know who you're going to run into or who you're going to meet or who's going to come up with a business idea or a thought and read" (E2). Serendipitous encounters at these events are particularly useful for entrepreneurs in the nascent business stage when resource access is limited, and the business model is still under development. For example, one education technology entrepreneur shared a story about how the founding team was inspired by an audience at the startup competition:

> I think in the last competition that we went the one guy told us what to do with the data that we never thought about that... we thought it is brilliant because we're still looking into ways of how to make money or how to convince people that we are eventually going to make money. (E15)

The advice received at a startup competition event offered this edtech founding team new insights to their business model and product features. Such serendipitous encounters were mentioned mostly (12 out of 20) by founders in highly uncertain nascent stages. As ideas become more developed and the priority shifts to profit generation, entrepreneurs start engaging with direct knowledge sources such as customers and suppliers to focus on getting the business done.

Another benefit of increasing public visibility is to break the constraint of relying on strong ties for knowledge. The role of weak ties in sharing knowledge within organization has been well-discussed in prior studies (Hansen, 1999). When entrepreneurs seek knowledge or advice, they also emphasized the strength of weak ties in offering unbiased and diverse opinions. For example, one entrepreneur said that "I wouldn't say go to your friends when it comes to feedback on your business or feedback on how you present or even on your product, because friends rarely will tell you the total honest truth" (E2). Another female entrepreneur also expressed the preference of using public channels to access knowledge instead of using close social circles:

> I prefer actually just posting on Facebook because for some reason my close friends, not that they help me any less, I just feel like for some reason, it's weird. It's similar to a job search… I posted on Facebook and this random acquaintance of mine messaged as she was, like, "Yeah, I'll help you." So for me it's sometimes better to actually just post in a broader environment because it does test the channels. It tests whether somebody resonates with that and whether they'll reach out to you versus, I don't know, if I really individually reached out to each of my close friends, they were probably think for me, but for some reason, it's less helpful than random acquaintances. I don't know why. (E9)

The preceding quotes demonstrate that increasing public visibility has been used as a strategy among the respondents to overcome the constraints of their immediate social network and to gather information from broader audiences. The "random acquaintance[s]" emphasized above feature a group of hidden knowledge sources that often escape the reach of knowledge seekers. It might be due to knowledge seekers' unawareness of their expertise or their willingness to contribute. In addition, the founder quoted indicate the objectivity of information received from those "random acquaintance[s]." Compared to close friends, weak ties or indirect connections on social media are often in a better position to offer valuable insights on business-related questions. When it is hard to identify knowledge sources, or when entrepreneur want to initiate

serendipitous knowledge-seeking relationships, increased visibility will help reverse the seeking process and increase the likelihood of receiving hidden information.

Increase the awareness of knowledge. According to the interview data, first-time entrepreneurs (or those with limited experience in the field of their new business), viewed their unawareness of the existence of information as a key barrier for knowledge access. For example, one first-time female entrepreneur used "blinders where you can't see" to refer to the subtle and specific entrepreneurial knowledge that is not even considered in the knowledge searching process:

> When you're just entering something, you understand this is the start of the world that you have to understand when you first enter. You see and understand this much of it. So when you start talking, you don't even know that you need to be aware of that, that, that, and that. So what's it called? Blinders where you can't see. They make you realize everything you don't know and then once you know what you don't know, you go, okay. I need to go and learn that and then you learn on your own. (E12)

The female entrepreneur quoted above indicates that usually entrepreneurs' prior experience predetermines the scope and depth of knowledge within their cognitive ability. Without sufficient awareness of the information, founders cannot effectively frame the question and seek the answer. Knowing "what you don't know" is the first step in the knowledge-seeking process.

Many of the answers for the open-ended question in the survey (see Figure 16) also expressed similar ideas in regard to how "business ignorance" becomes a disadvantage for entrepreneur to effectively seek knowledge. Such ignorance also includes the difficulty in thinking of the right question, understanding where to find things, and the prioritization of information needed at different stages. A student founder still in the process of product development remarked:

> Knowing what I need to know is hard. In business, ignorance is a huge weakness. If I am not familiar with something or have never been exposed to it in media or in school or life I will not know that I need to look into it. I will never get the information. (E4)

Increasing information exposure at the early stage of founding a business thus becomes a typical way for entrepreneurs to mitigate the negative impact of their limited experience. This is particularly relevant during the nascent stage of product development and customer discovery when the product has not officially launched. The entrepreneurs interviewed leveraged a variety of communication channels to learn about industry trends and new technological ideas, and to understand the causal relationships between things. In general, offline activities in meetups or conferences, social media use, and other online information channels are the three most frequently mentioned approaches to increase information exposure and the awareness of specific knowledge. Meetup.com is particularly popular since it enables location-based community gatherings with low entrance requirements. Entrepreneurs can access information from different fields and connect the dots to discover new opportunities. For example, as a lawyer-turned-tech entrepreneur explained:

> A huge thing, I guess it's technically social media is Meetup.com. A lot of my knowledge has come from going to Meetup events and learning a lot about the latest in tech in the industry. That is one thing that I would say is a great advantage when you go to Meetup events and you get to hear the companies that are making products now, you know? I mean, college is great, but college you're learning a lot of theory and a lot of ideas. (E17)

In a city with soaring numbers of startups in hybrid industries, such as applying virtual reality in legal processes or integrating artificial intelligence in music production and distribution, offline connections provide an easy way to access resources.

Another common practice among the entrepreneurs interviewed is to devote considerable time to keeping apprised of industry knowledge or broader social context on social media, other user-generated media or online impersonal sources. With limited established information databases and substantial competition among entrepreneurs, people are always trying to enlarge

their search radius. For example, the female founder of an AI startup in healthcare described the way she accesses information by enlarging the scope of her search for that information:

> I have to read a lot. I'm reading tech blogs, business blogs, business newspapers, magazines, information on social media about how other startups are doing. If they sell their company or not? If they are, they may be, IPO, how is their exit? Who are invest in them, who are not? What are the new technologies companies are using for HR? I read a lot. So, with this knowledge every day I have to read it in the morning so then I can have another view of my company or another view of the decision I have to take. (E18)

The broadening of information exposure can help entrepreneurs generate new idea in product development and identify new opportunities to combine resources. With better awareness of the existence of knowledge, entrepreneurs would possibly experience less uncertainty in the knowledge-seeking process.

Access to indirect knowledge. When knowledge is complex and tacit, entrepreneurs usually could not find direct answers to their business problems. Therefore, several of the entrepreneurs interviewed highlighted how they seek indirect knowledge to inform their decision-making. Indirect knowledge refers to the information that could not be simply applied to the problem at hand but requires extra interpretive and reflective effort from the entrepreneurs. There were three ways of accessing indirect knowledge identified: through personal reflection, learning from peer entrepreneurs' problem-solving process and learning from other startup stories. It is interesting that this practice is popular among the female entrepreneurs interviewed, with four out of five of them having this strategy to cope with knowledge ambiguity.

From personal reflection. With limited information on how to improve the product and determine customer preference in knowledge-intensive industries, entrepreneurs tend to rely on observations and constant "changing and testing" to make inference about the market and reach a logical conclusion. The use of personal reflection helps entrepreneurs overcome the difficulty of accessing explicit knowledge in emerging markets. A variety of media channels including phone

calls, email, social media, and face-to-face meetings were mentioned for the purpose of reflective learning. For example, the female founder of a business consulting service established in 2018 said that:

> Feedback is changing and testing. For example, I set up a lot of those phone calls and the first three, five minutes is always you just explaining your business and on every single call I change something to see how it went and then I would take notes while I was talking to them and take notes on what questions are they asking so that the next time I would address that in my pitch and not just them getting to it. Things like that. I think that, yeah, it requires getting someone on the other line to give you that feedback, but also requires you to reflect and you just change, and you need to take notes. (E12)

As the founder's quote suggested, entrepreneurs' knowledge-seeking is more of a knowledge generation process when it comes to product development and market exploration.

From peer entrepreneurs' problem-solving process. The entrepreneurs interviewed also mentioned the importance of learning from entrepreneurs who are working in similar industries. For example, as explained by two founders, they both downloaded the apps of their competitors to learn about the best practices. The first explained:

> You know we keep reading about other apps, you know. Kind of to try to make our app not similar but to have some similarities with those other apps, you know? We try to see that other apps in education and see what kinds of features that they have, how they present information. (E15)

And in a similar way, another entrepreneur noted:

> I always read about some startup and I download their app. Because I want to see what they are doing. What is, why people are downloading their app? Why they like them? What ideas can I have of those technologies. That's why I do. And then I go to my engineer team and I say like, I saw this, I like this, why don't we do something with this and they say, like, okay, well, we're going to try it. (E18)

The perception of technology is personal and hard to be articulated by knowledge sources, so that the learning by using strategy helps entrepreneurs understand the value of a product from a customer's point of view. Through experiencing other entrepreneurs' products, and finding the similarities, both of the founders quoted above were able to reflect upon their own businesses.

Entrepreneurs also learn from other industries by participating in meetups and conferences. Although the context and business approaches are often very different, entrepreneurs could learn about the causal relationships between actions and results from others' problem-solving processes and use those insights to facilitate their own knowledge development. For example, the lawyer-turned-entrepreneur explained why he was actively involved in healthcare meetups even though the knowledge is not directly transferable to his VR startup:

> They inspire me because they're innovating their industries. I would say the difference is with something like more science-based like healthcare, there may be more of a scientific approach. When you're dealing with law, you're basically dealing with convincing people. (E17)

Another entrepreneur also pointed out that by exchanging information with peers from diverse industry backgrounds, they can inspire each other to question the norms or values deeply rooted in certain social contexts and figure out the possibilities that were usually overlooked. He cited the fact that he and his CEO buddy are from different industries as the reason why sharing problem-solving processes with peers could serve as a catalyst for them to reach a solution.

> He's in a completely different industry, but sometimes the challenges crossover. We come from different industries. He might have a problem in his industry, and to me that's just such an obvious thing because the way I do things. (E6)

From startup stories. In addition to seeking indirect business insights, entrepreneurs also rely on learning about startup stories to make sense of how peers handle stress and navigate roles and responsibilities as business owners. Online channels such as podcasts, YouTube, and blogs were most often mentioned. As indicated by a female founder:

> So, what I do is every morning, I just listen to positive videos. I listen to a lot of startups' or founder's experience on YouTube every morning, like when I'm dressing up, I just listen how did they, how they did it. How if they were in bankruptcy, how did they raise another company? So that makes me a lot of energy. Because I'm listening to people who were worse than where I am, and they did, better than I am now. (E18)

Those success or failure stories enable entrepreneurs to develop their attitudes and beliefs in dealing with uncertainty. They help entrepreneurs develop internal resilience to better cope with knowledge ambiguity.

Specialization within team. In dealing with the complexity of knowledge and the complexity of roles and responsibilities, entrepreneurs reported that they rely on task specialization within the founding team to facilitate the interpretation of information and the access of knowledge. Transactive memory theory argues that employees often rely on each other as a source of information and develop an awareness of teammates' different domains of expertise (Wegner, 1987). Entrepreneurs also leverage founding team specialization to breakdown the knowledge-seeking tasks. As one entrepreneur noted:

> My partner Vince consumes more of the market data so like what's happening in the industry and keeping up with market trends and I deal more in the technology and the product needs. And Vince does the meetups and the conferences. He was an MBA, he's got the business background more so than me. So, we sort of split those responsibilities. I do more of the once the deal is coming together, we're in the room together and forming the relationship but he does more of the sourcing of customers. (E19)

From the founder's comment we can see when there is a founding team, entrepreneurs can reduce the complexity and ambiguity of knowledge by splitting the responsibilities. The heterogeneity among knowledge components is considered a strong foundation for organizations to generate new sources of competitive advantage (Eisenhardt & Santos, 2002; Kogut & Zander, 1992). This explains why founding team expertise complementarity is one of the key strengths in securing investment (see Table 8 for codes, definitions and exemplary quotes).

Overall, the findings in this research suggest that when knowledge ambiguity is unavoidable and predictable in a nascent market, entrepreneurs leverage media channels and social networks strategically to facilitate the access, interpretation and generation of knowledge.

Table 8

Knowledge Ambiguity Coping Strategy Sample Codes, Definitions, and Exemplary Quotes

Topic	Concept	Description	Exemplary Quote
Knowledge ambiguity coping strategy	Optimize information relevance	Filter out unwanted information and increase the relevance of information received	*"Then like filtered based on information that I thought. I downloaded all these tweets and then I filtered on like DAO and I filtered on like this so it's just like oh, here are the 12 tweets that Vitalik thinks about or Vitalik publicly stated related to his own project, related to this exact thing, and then help me, like connect the dots between, you know, what he was doing."*
	Enhance communication efficiency	Increase the quality and quantity of information access within a given time	*"If I want to hear or feel on a more motive level, then I absolutely want a meeting. If I'm going to ask him okay, I want to run my approach by you on the new presentation deck that we worked on, I want to do that in person. I want to look him in the eye and I want to see what his response is, but yeah so text is for very quick things like ask for a meeting, can I call you."*
	Change in public visibility	Use personal branding, social presence, and other strategies to gain attention from knowledge source	*"I also think that it's very important to be very public, so if you can speak in public, if you have something that you say or that's unique, I think you should try to put yourself out there. It's for the best of the business. It's for your sake as well, and you never know who you're going to run into or who you're going to meet or who's going to come up with a business idea or a thought and read."*
	Increase awareness of knowledge	Increase the diversity and breadth of knowledge exposure (e.g. observation of trends, broadening of social networks, or seeking new ideas)	*"Knowing what I need to know. In business ignorance is a huge weakness. If I am not familiar with something or have never been exposed to it in media or in school or life I will not know that I need to look into it. I will never get the information."*

Table 8 Continued

Knowledge Ambiguity Coping Strategy Sample Codes, Definitions, and Exemplary Quotes

Topic	Concept	Description	Exemplary Quote
	Access to indirect knowledge	Obtain information not directly related to the problem (e.g. information about other entrepreneurs' problem-solving processes or successful stories)	*"So I was just listening to so many podcasts, like so many. I can list them. Just hearing other founders' stories. Both really successful founders and also the smaller ones. It is so helpful because those women are exactly where I am now. So that perspective is really valuable just hearing about how the CEO of Airbnb got to where they got."*
	Specialization within team	Coordinate with co-founders or team members how to slip the task of accessing knowledge	*"My partner consumes more of the market data so like what's happening in the industry and keeping up with market trends so I deal more in the technology and product needs."*

Chapter 7

The Influence of Prior Experience and External Communication

The second part in this dissertation aims to understand whether different dimensions of prior experience influence early stage entrepreneurs' media use, knowledge network engagement, and how these factors influences their knowledge access. Before discussing the statistical results on the hypotheses, descriptive statistics of the key variables were reported. In addition, the different communication behaviors associated with prior startup experience were examined.

Descriptive and Inferential Statistics

The following sections provide a summary of descriptive statistics that capture attributes of the entrepreneurs included in this study and inferential statistics that measure the representativeness of the sample utilized in this dissertation.

Breadth of prior experience. Descriptive statistics in Table 9 demonstrate that approximately 60% of the respondents reported that they had prior experience in one or two areas. About 34% of the respondents had experiences in more than three areas. There were also about 6% of the respondents with no prior experience, suggesting that they were college students or graduate school students with no previous working or functional experience. From Figure 16 we can see that more than 70% of the respondents had *industry experience* prior to founding their current businesses. About half of the respondents were veteran entrepreneurs, who had *startup experience* before either as the founder or an employee. About one fifth of the respondents had *senior management experience* in prior jobs. There were more respondents in the sample with *functional experiences in marketing and sales* (32%) and *R&D* (30%) than in *finance* (17%).

Table 9

Total Areas of Prior Experience among Entrepreneurs-Breadth of Prior Experience (N=100)

Total areas of prior experience	Percentage of respondents (*n*=100)
0	5.9%
1	33.7%
2	26.7%
3	17.8%
4	7.9%
5	5.9%
6	1%

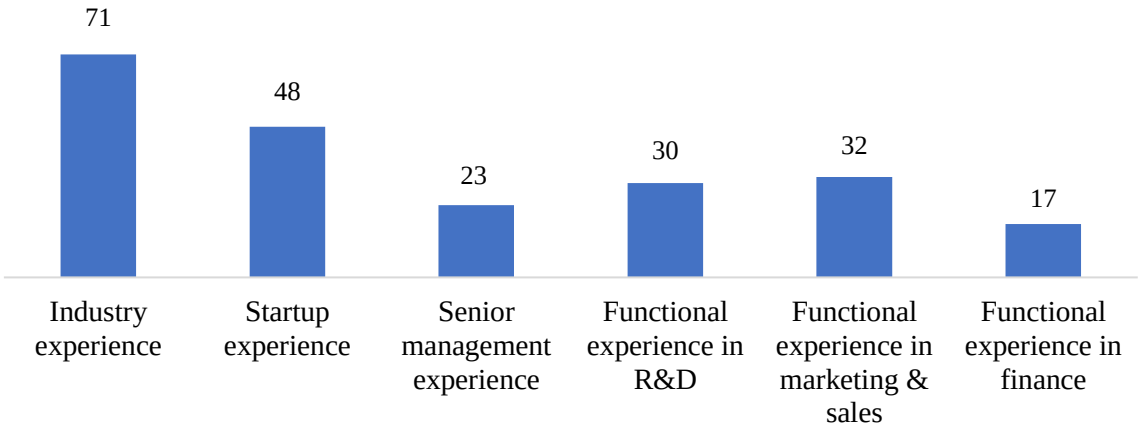


Figure 16. The Total Number of Entrepreneurs with Each Experience Area *(N=100)*

Relatedness of prior experience. In the survey, industry relatedness asks the extent to which they are operating in the same industry compared to previous job, and business relatedness captures the similarity of business approach used in their current startup and prior efforts. Assumption test confirms that industry background relatedness and business skill relatedness had significant correlation. It is interesting that approximately 25% of the entrepreneurs reported *very unrelated* for both dimensions, suggesting that they generally entered a new field in starting the new business. However, we can see that the percentage of entrepreneurs who reported

relatedness (58%) in industry dimension is higher than those (43%) in business dimension. This result shows that in the sample used in this dissertation the lack of related experience is more salient when it comes to the business approach.

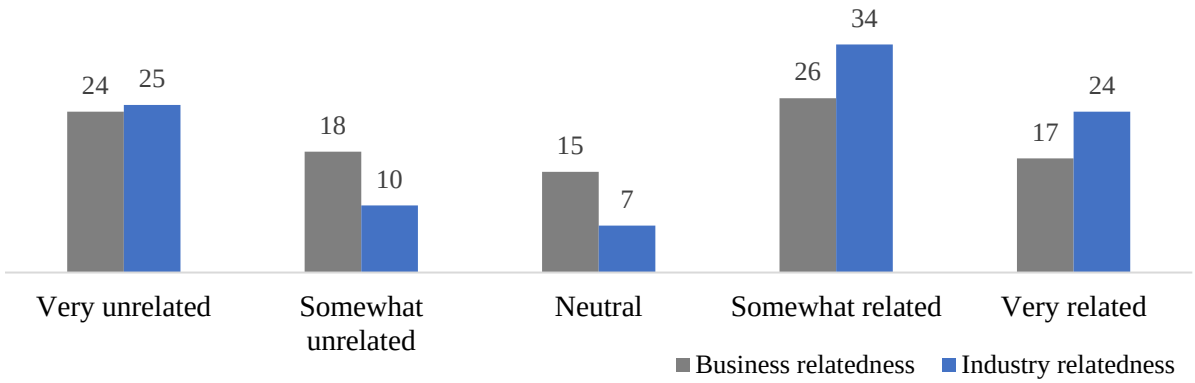


Figure 17. Relatedness of Prior Experience in Business Approach and Industry Context *(N=100)*

Media use. Figure 18 demonstrates the distribution of entrepreneurs who reported monthly, weekly, and daily use across eight online media channels. Combining monthly, weekly or daily use together, *LinkedIn* had the highest usage frequency (77%), following by *blogs* (66%), *YouTube* (63%), *Facebook* and *Twitter* (both 56%). On a weekly basis, the top three used media channels were *LinkedIn*, *YouTube*, and *Twitter*. On a daily basis, the top three most frequently used were *LinkedIn*, *blog*, and *Facebook*. There were more entrepreneurs using *Facebook* on a weekly basis (25%) than daily (17%) for business purpose, but more people using *Twitter* on daily basis (21%) than weekly (14%). *Reddit*, a news aggregation website, was included since the intention was to use it as a representative online discussion forum. Only 20% of the respondents reported using Reddit weekly or daily, which might be because they were using other similar discussion forums such as Quora, VentureTips, etc.

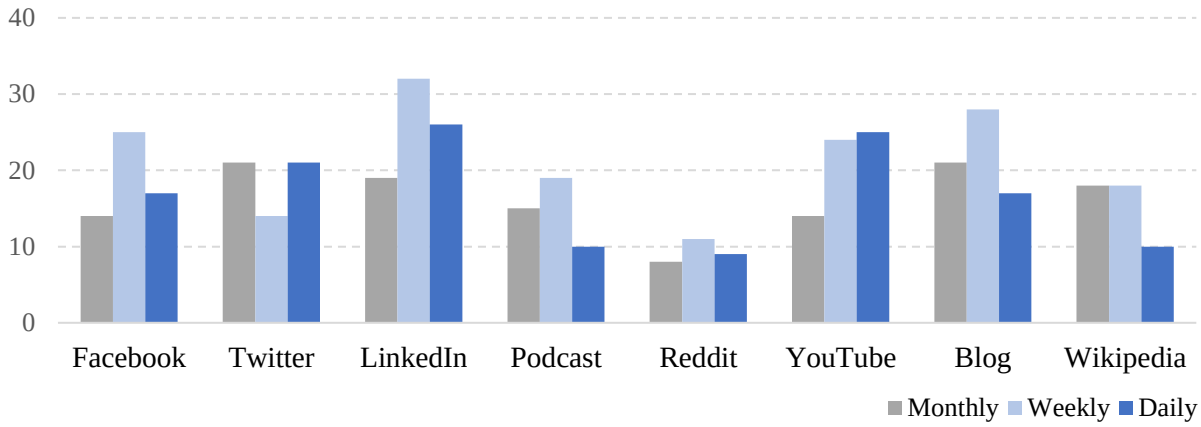


Figure 18. The Number of Entrepreneurs at the Monthly, Weekly, and Daily Frequency of Media Use *(N=100)*

Knowledge network engagement. In the questionnaire, respondents were asked to report how frequently they engage with various knowledge sources to obtain information for their startups. According to Figure 19, combing monthly, weekly, and daily use, *other entrepreneurs* (92%) was rated as the most frequently engaged knowledge source by respondents, with *customers* (91%), friends (90%), and *mentors or advisors* (86%) following behind. In terms of monthly engagement, *investors* (39%) was ranked as the top and *mentors or advisors* as second (31%). In regard to weekly engagement, the top three sources were *friends* (50%), *other entrepreneurs* (49%), and *mentors or advisors* (43%). For daily engagement, *customers* (33%), *generally available reports or books* (25%), and *friends* (24%) were the most reported knowledge sources. These frequency results indicate that entrepreneurs viewed other entrepreneurs as a critical source of entrepreneurial knowledge, and also considered customers as invaluable information providers.

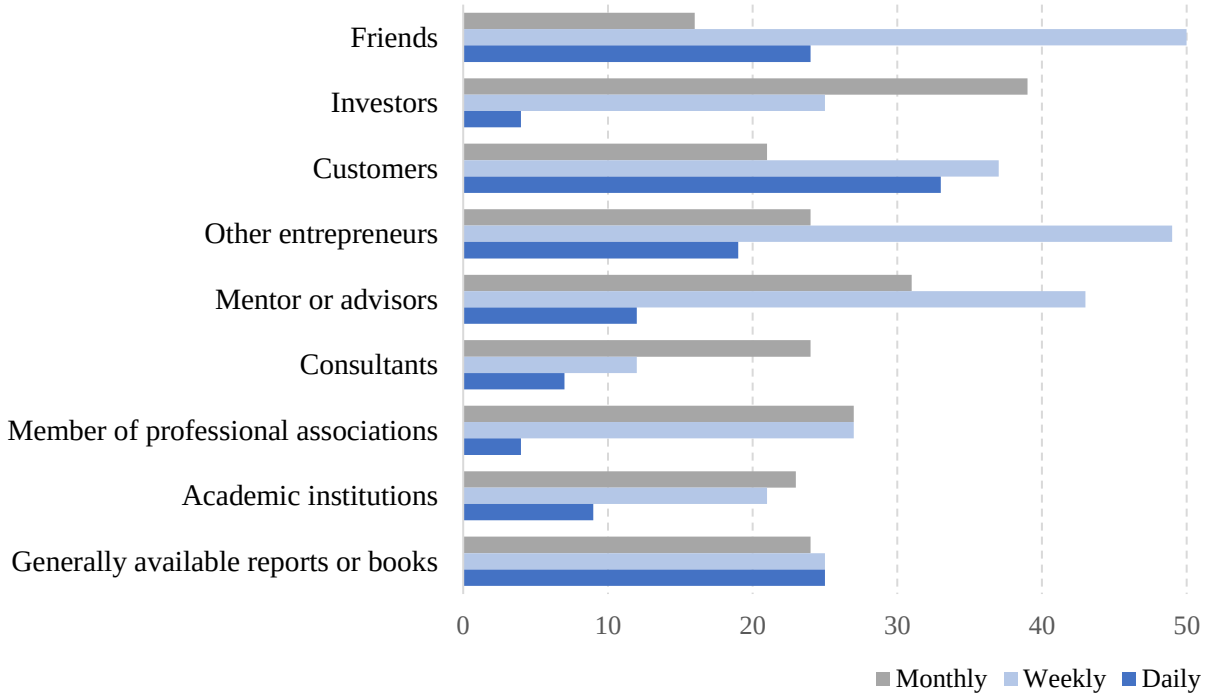


Figure 19. The Number of Entrepreneurs at the Monthly, Weekly, and Daily Frequency of Knowledge Network Engagement *(N=100)*

Perceived knowledge Access. Respondents were asked to report how difficult or easy it was for them to access specific knowledge when planning their current startup across six areas. The data show that the overall perceived difficulty of accessing a combination of entrepreneurial knowledge is leaning towards neutral. From *Figure 20* we can see that there were more entrepreneurs who rated knowledge access as very easy or somewhat easy than very difficult or somewhat difficult. Among the very few answers of *very difficult*, *hiring and partnership* knowledge accounted for the biggest portion (36%) followed by *R&D and technology* knowledge (28%) and knowledge about *market conditions* (20%). Although only one respondent listed knowledge access for *finance* as *very difficult*, about one third of the entrepreneurs chose *somewhat difficult*. On the contrary, only 9% of the respondents considered career-related knowledge as difficult to access. Therefore, the order of knowledge access difficulty from the

highest to the lowest was as follows: finance > market conditions > hiring and partnership > R&D and technology > management practices > career-related.

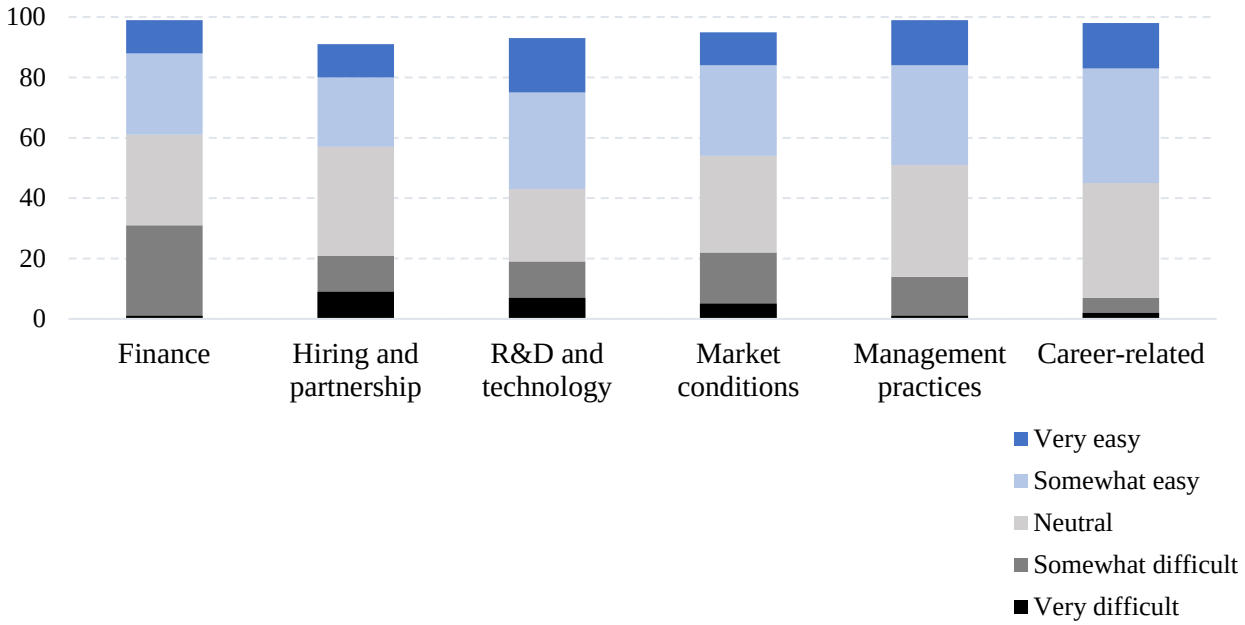


Figure 20. Entrepreneurs' Perceived Difficulty of Knowledge Access in Six Areas *(N=100)*

The Influence of Prior Startup Experience

Participants were asked to report whether they have startup experience in the question asking about their breadth of experience. If participants have startup experience, they were marked as veteran entrepreneur. If participants had no startup experience, they were marked as novice entrepreneur. Summary of intercorrelations, means, and standard deviations for Variables in the second research component was listed in Appendix A-1. Overall, there were slightly more novice entrepreneurs (56%) in the sample for this dissertation. An independent sample t-test was conducted to examine the mean difference of media use, network engagement, knowledge access and knowledge explicitness between novice and veteran entrepreneurs. In general, the results suggest that there was a statistically significant effect of startup experience on media use, knowledge explicitness and perceived knowledge access for the two groups (see Table 10 for results).

Table 10

Independent Sample t-test of Variance of External Communication and Knowledge Access by Startup Experience (N=100)

Variable	Novice entrepreneur (n=56)		Veteran entrepreneur (n=44)		95% CI for mean difference	r	t	df
	M	*SD*	*M*	*SD*				
Media use	1.36	1.25	2.04	1.80	[-1.29, -.06]	.44	-2.20*	102
Network engagement	1.59	1.20	2.15	1.79	[-1.14, -.03]	.37	-1.88	102
Knowledge access	3.16	.57	3.49	.77	[.60, -.08]	.49	-2.58*	102
Knowledge explicitness	3.23	.63	3.48	.59	[-.49, -.01]	.41	-2.04*	102

*p<.05, **p< .01, ***p< .001

Mean scores of media use were higher among veteran entrepreneur (N=44, *M*=2.04, *SD*= 1.80) than novice entrepreneur (N=56, *M*=1.36, *SD*=1.25). Levene's test rejected the null hypothesis of equal variances between the two groups (F=7.760, $p<.05$), so an adjusted version of the independent samples t-test that relaxes this assumption was chosen. The difference in means (difference=.680) was statistically significant, $t(81{,}945)= -2.196$, $p=.031$.

Similarly, mean scores of knowledge access were higher among veteran entrepreneurs (N=44, *M*=3.50, *SD*=.77) than novice entrepreneur (N=56, *M*=3.12, *SD*=.57). Levene's test was not statistically significant so the equal variances assumed output was used. The difference in means (difference=.339) was statistically significant, $t(102)=-2.584$, $p=.011$. In addition, it was observed that mean scores of perceived knowledge explicitness were higher among veteran entrepreneur (N=44, *M*=3.47, *SD*=.59) than novice entrepreneur (N=56, *M*=3.23, *SD*=.63). Based on the equal variances assumed output, the difference in means (difference=-.24) was statistically significant, $t(102)=-.204$, $p=.044$.

However, although the mean scores of network engagement was as well higher among veteran entrepreneurs (N=44, *M*=2.15, *SD*=1.79) than novice entrepreneur (N=56, *M*=3.16, *SD*=.77), the difference was not statistically significant, $t(102)=-1.883$, $p=.063$. As indicated in Table 10, the effect sizes of these four variables range between .37 to .49, which were considered as medium sizes according to Cohen, Cohen, West, and Aiken (2013).

Taken together, these results suggest that compared to novice entrepreneurs, veteran entrepreneur tend to use online media channels more frequently for seeking knowledge. While veteran entrepreneurs reported easier perceived access of startup knowledge, they also perceived entrepreneurial knowledge as more explicit than novice entrepreneurs. It means that veteran entrepreneurs find information better explained in text-based formats (e.g. reports, emails,

messages) and they also thought the text-based information was easier to understand. This is consistent with findings from previous literature that prior experience will increases the cognitive ability in interpreting information.

The Influence of the Breadth of Prior Experience

The conditional process model 5 (see *Figure* 13(a)) was conducted to evaluate the direct effect of breadth of experience on media use and network engagement, the direct effect of media use and network engagement on knowledge access, and the indirect effect of breadth of experience on knowledge access through media use and network engagement. In addition, it tested whether the indirect effect of breadth of experience on knowledge access is moderated by the level of knowledge explicitness. The results suggest that the whole set of predictors contributes to statistically significant variance in entrepreneurs' knowledge access (R^2=.45, F=7.32, p <.001). This result indicates that approximately 45% of the variance of knowledge access was accounted for by the combination of breadth of prior experience, media use, network engagement, knowledge explicitness, and the five control variables.

As shown in Table 11, the breadth of prior experience reported a non-significant negative direct effect on knowledge access (B=-.04, p>.05). It suggests that early stage entrepreneurs with more diverse prior experience did not report easier access of startup-related knowledge. H_1 was not supported. Breadth of prior experience showed a non-significant positive direct effect on media use (B=.17, p>.05). H_7 was not supported. Breadth of prior experience reported a statistically significant positive direct effect on network engagement (B=.44, p<.001). Early stage entrepreneurs with broader areas of prior experience tend to have more frequent interactions with their knowledge networks. In other words, the diversity of prior experience contributed significantly to their leverage of a variety of knowledge sources. H_8 was supported.

Table 11

Moderated Mediation Model Results Testing Breadth of Prior Experience Effects on Knowledge Access Outcomes Through Media Use and Network Engagement, Depending on Knowledge Explicitness (N=100)

Variable	B	*SE*	*t*	*p*
Mediator variable model: effect on of media use				
Breadth of prior experience	.17	.13	1.34	.18
Mediator variable model: effect on network engagement				
Breadth of prior experience	.44***	.11	3.86	.00
Dependent variable model: effects on knowledge access				
Breadth of prior experience	-.03	.05	-.82	.42
Media use	.09*	.04	2.56	.01
Network engagement	-.04	.04	-.91	.36
Breadth of prior experience x Knowledge explicitness	.19***	.05	3.78	.00

Note. B = unstandardized coefficient; CI = confidence interval.
*p<.05, **p< .01, ***p < .001

It was also found that media use significantly predicted knowledge access (B=.09, p<.05). Early stage entrepreneurs who used various online media channels more frequently reported easier access to startup knowledge. H_5 was supported. However, knowledge network engagement reported a non-significant negative effect on knowledge access (B= -.04, p=.36). H_6 was not supported.

H_2 predicted that the positive impact of having broad range of experiences on knowledge access will be reduced when knowledge explicitness is low. Although the full model shows that the interaction term was statistically significant (B=.19, p<.001) between the independent variable and moderator, further probing was not conducted since the main effect of the independent variable on the dependent variable was not statistically significant. Therefore, the

moderating effect did not exist. H_2 was not supported. *Figure 21* shows the results of the whole model.

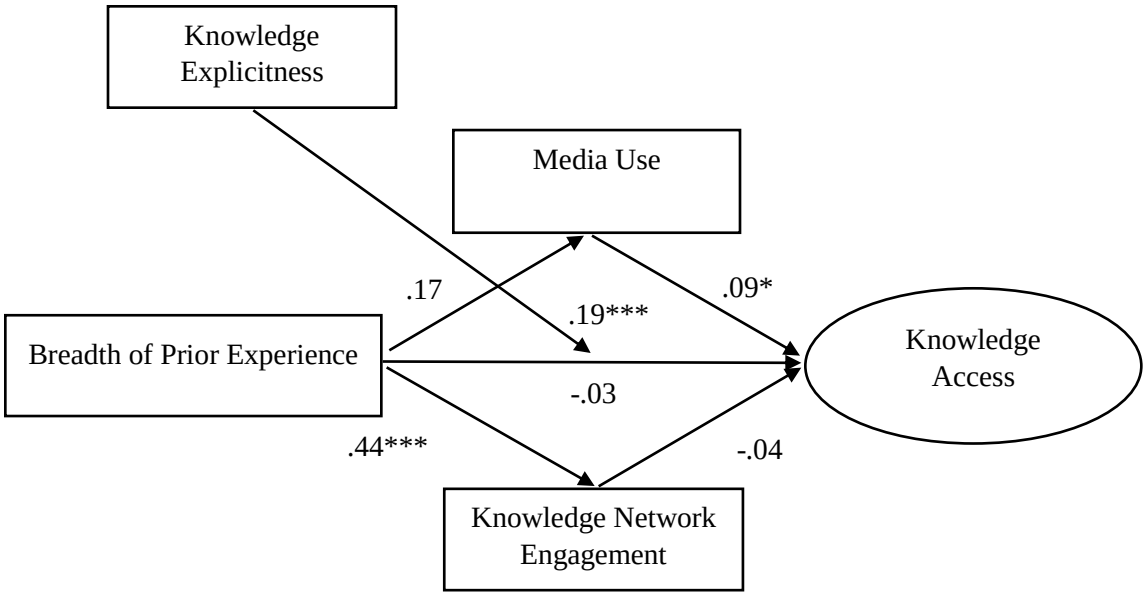


Figure 21. Hypothesized Model of Breadth of Prior Experience and Knowledge Access with Results *p < .05, **p < .01, ***p<.001

The Influence of the Relatedness of Prior Experience

Similar to previous analysis, conditional process model 5 was conducted to evaluate the direct effect of relatedness of experience on media use and network engagement, the direct effect of media use and network engagement on knowledge access, and the indirect effect of relatedness of experience on knowledge access through media use and network engagement. In addition, it tested whether the indirect effect of relatedness of experience on knowledge access depends on the level of knowledge explicitness. The results suggest that the whole set of predictors contributed to significant variance in entrepreneurs' knowledge access (R^2=.44, F=6.86, p<.001). This result indicates that approximately 44% of the variance of knowledge access was accounted for by the combination of the focal constructs and the five control variables.

As shown in Table 12, relatedness of prior experience reported a statistically significant negative direct effect on knowledge access (B= -.71, p<.05). It suggests that early stage entrepreneurs with more related background tend to express lower level of knowledge access for their startup businesses. Thus, H_3 was supported. Relatedness of prior experience shows a non-significant negative direct effect on media use (B= -.07, p>.05). Again, H_7 was not supported. While the whole set of predictors including relatedness of experience and five control variables did not contribute to significant variance in knowledge network engagement (R^2=.11, F=1.86, p=.10), relatedness of prior experience reported a statistically significant positive direct effect on network engagement (B=.30, p<.05). Entrepreneurs with more related prior experience tend to interact with their knowledge networks more frequently. This finding means that entrepreneurs operating in a similar industry or using a similar business approach for their startup businesses have higher frequency of external communication with knowledge networks. H_8 was supported.

Table 12

Moderated Mediation Model Results Testing Relatedness of Prior Experience Effects on Knowledge Access Outcomes Through Media Use and Network Engagement, Depending on Knowledge Explicitness (N=80)

Predictor	B	*SE*	*t*	*p*
Mediator variable model: effect on media use				
Relatedness of prior experience	-.07	.13	-.54	.59
Mediator variable model: effect on network engagement				
Relatedness of prior experience	.30*	.12	2.41	.02
Dependent variable model: effects on knowledge access				
Relatedness of prior experience	-.71**	.22	-3.2	.00
Media use	.10**	.04	2.68	.00
Network engagement	-.08	.04	-1.88	.06
Relatedness of prior experience x Knowledge explicitness	.21**	.06	3.35	.00

Note. B = unstandardized coefficient; CI = confidence interval.
*$p < .05$, **$p < .01$, ***$p<.001$

The fourth hypothesis stated that the negative impact of relatedness of experience on knowledge access will be stronger when knowledge is well-documented. The full model shows that the interaction term was significant (B=.21, $p<.05$) between independent variable and moderator. This interaction is illustrated in *Figure 22*. The interaction was probed by testing the conditional effects of relatedness of prior experience at three levels of knowledge explicitness. Examination of the interaction plot shows that relatedness of experience was significantly related to knowledge access when knowledge explicitness was one standard deviation above the mean ($p<.05$), but not when at the mean ($p=.97$) or below the mean ($p=.05$). It means that the negative relationship between relatedness of experience and knowledge access is more evident when knowledge explicitness is high (B= .11, $p<.05$). In other words, when knowledge is well-

codified, the disadvantage of having related prior experiences on knowledge access for current startup is increased. H_4 was supported.

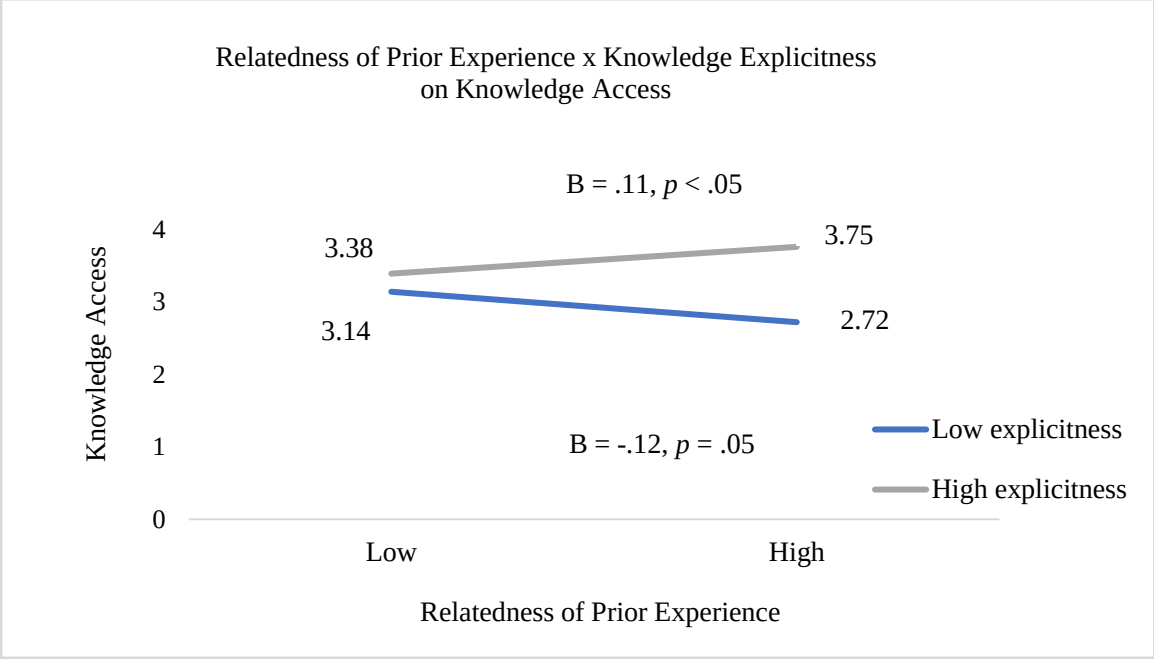


Figure 22. Interaction Between Knowledge Explicitness and Relatedness of Prior Experience on Knowledge Access

Looking again at the full model, media use significantly predicts knowledge access (B=.10, p<.05). Early stage entrepreneurs who use various online media channels more frequently reported easier access to startup knowledge. H_5 was supported. However, knowledge network engagement reported a non-significant negative effect on knowledge access (B= -.08, p=.06). H_6 was not supported. *Figure 23* shows the hypothesized model with results.

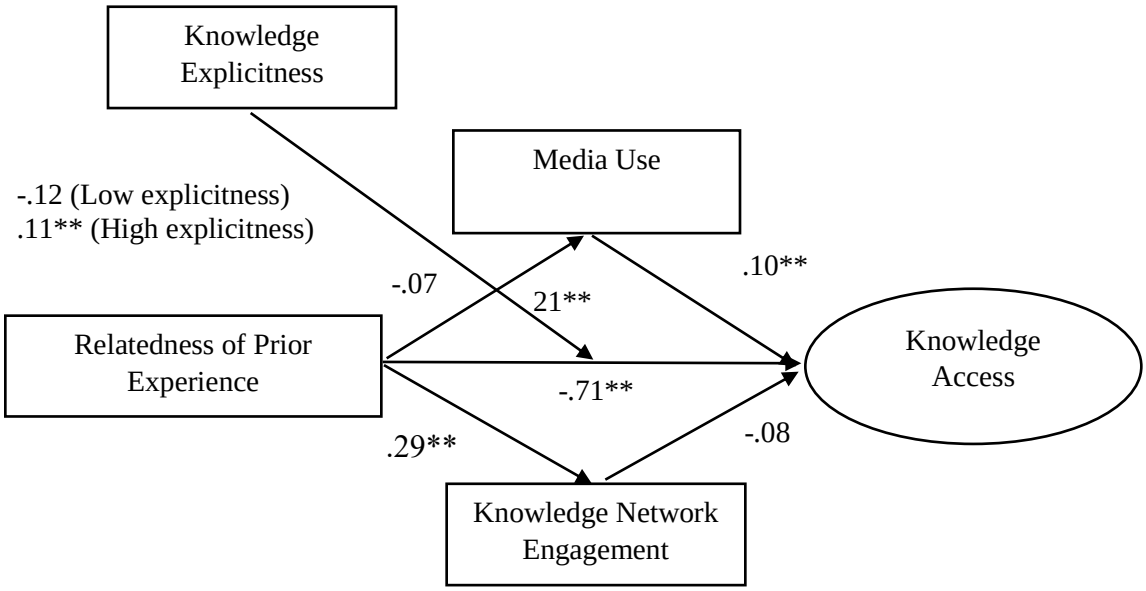


Figure 23. Hypothesized Model of Relatedness of Prior Experience and Knowledge Access with Results *p< .05, **p< .01, ***p<.001

Chapter 8

Mentor Engagement and Media Multiplexity

Overall, the third part of the dissertation examined the communicative patterns in the dyadic relationship between entrepreneur and mentor. The first half focuses on understanding the way entrepreneurs select and engage with mentors and this research question was mainly answered with interview data. The second half mainly uses survey questionnaire data to investigate how entrepreneurs' media use impacts relationship development with mentors and knowledge acquisition. The qualitative and quantitative data were mixed together in understanding entrepreneurs' motivations and behaviors.

Mentor Selection and Engagement

The third research question aimed to explore the criteria entrepreneurs use to select mentors and the way in which they engage with mentors. The interview data collected in this study suggest that these entrepreneurs tend to balance the accessibility and capability in selecting mentors, and they strategically manage the layering of relationships with mentors. In addition, entrepreneurs also interpreted the concept of mentorship differently compared to in intra-organizational setting. For example, they rely on peer entrepreneurs as a critical source of knowledge and social support, and they often develop a community of potential mentors to maximize knowledge acquisition.

Balance of accessibility and capability. Depending on the industry, mentors are usually other successful entrepreneurs within the same locality, angel investors, corporate executives, former academic advisors, or scientists who provide advice for younger entrepreneurs (Cohen, 2013; Spigel, 2017a). To serve as role models or network brokers, these mentors are usually well-established in the field with a variety of social commitments. Entrepreneurs form beliefs

about their own capabilities by comparing themselves to others, especially proficient role models (e.g. mentors) who have achieved visible success (Boyd & Vozikis, 1994). Although these reputable mentors enjoy high perceived value from entrepreneurs for their credibility and expertise, many of the entrepreneurs in the sample in this dissertation mentioned that another critical dimension is the accessibility and willingness to invest time in mentoring.

Mentors with deep industry knowledge and connection and mentors with time and willingness to become involved in the entrepreneurial process help with the developmental activities in different ways. In the nascent stage of development when the focus was on idea conception and market exploration, the psychosocial function of mentor plays a critical role in helping entrepreneurs survive the initial stage of uncertainty. Time investment from mentors leads to the offering of friendship, confirmation, and personal feedback, all of which help strengthen entrepreneurs' confidence in further pursuing the new venture. However, as an initial idea evolves into an actual business model with the purpose of creating market needs and generating profit, mentors with deep industry connections can make more important contributions to the growth of the businesses. For example, one female MBA founder shared how she thought about the generous support she gained from a school career advisor and also the need to find other mentors with deep industry expertise and influence:

> It's a combination of willingness to help and ability to help. I would say my current mentor doesn't have that much of an ability to help because ideally my mentor should have somebody with deep connections within the industry, right? So far it's been great to get me started but going forward I would want three advisors that have the strategic connections to actually open doors to get business done. (E7)

The female founder quoted above engaged in casual talk multiple times per week using different media channels to discuss even minor progress. She explained that the mentorship relationship "[is] more than the frequency it's the flexibility to contact in different ways that I find extremely

useful." However, she was also aware that for long-term concerns, it is necessary to have mentors who can bring in industry connections and really help nurture the expansion of business.

Another founder indicated that a mentor's accessibility is a prerequisite for capability to really make an impact. The offering of good advice is contingent upon a thorough understanding of the problems facing the new organization. Obtaining such tacit knowledge necessitates the time investment from mentors. The entrepreneur quoted below was revising his business model and he heavily relied on external input to assist decision-making. As shown in the following quote, he expressed the difficulty of getting good advice even though the mentor's background is highly relevant:

> If you talk to an advisor it's very difficult for that advisor to give good advice unless they deeply understand the company. So, there's a huge upfront investment in getting an advisor to understand your company and your team well enough to actually be helpful. And so few advisors are actually willing to make that investment because it's like -- people only have so much time. (E16)

To enhance the accessibility of mentors, sometimes entrepreneurs intentionally formed relationships with multiple mentors with different specializations. For example, one founder mentioned that he had three core mentors, "A Cornell professor, a marketing guru at Gray Media, and a design advisor at Google" (E19). These three mentors represent academic research, industry knowledge, or functional expertise. Therefore, the founding team could enhance the accessibility of each mentor focusing specifically on their core strengths.

The tension between accessibility and capability was also discussed by entrepreneurs who have participated in sponsorship programs such as incubators and accelerators. Incubators are hubs that are conducive to the 'hatching' of new business, providing a pool of shared support services to help entrepreneurs reduce costs and nurture growth (Bergek & Norrman, 2008). Incubators focus on connecting early stage entrepreneurs with external resources such as

investment, mentors, or partners via programs and initiatives (Amezcua et al., 2013; Collinson & Gregson, 2003). Observational data from the graduate showcase of a digital media incubator show that incubators often offer a pool of mentors for entrepreneurs to select from based on functional similarity and business needs. However, according to the interviewees in this study, the "mentor pool" format offers limited advantage for entrepreneurs to build social relationships with mentors. Mentorship gained through the connection of incubator tend to be business-oriented without extended social interactions or relationship development. For example, one MBA founder who went through an accelerator program indicated that even though the founding team knew that this is a person made available for consulting on certain topics, they will not consider this availability as an indicator of relationship, explained in the following:

> We met someone who was like, through the Accelerator, and she was like yeah, I'd love to support you guys so we had a couple meetings and she was like yeah, let me know how I can ever support you guys. But, you know, it's not like I can only meet with her every month or quarter. It's just like I know if I need someone in media to reach out to, then I will. But I would say that's not as much as a mentor. It's just like support, like hey, I appreciate what you are doing. We like what you're doing. Just keep going and we'll try and help you. (E11)

As the preceding quote shows, without the presence of regular social interactions, mentorship is no longer a development-oriented interpersonal relationship, but more in the style of problem-based consulting. Previous discussion mentioned that the unawareness of knowledge is a widely-acknowledged barrier for seeking knowledge. Mentors often are expected to play an observational role in tracking the progress and providing guidance accordingly. This is particularly important when the problem eludes the cognitive ability of entrepreneurs or when the problem is hard to articulate. Therefore, problem-based mentorship might fail to transfer knowledge timely and effectively.

Relational Multiplexity. Previous research shows that multiplex relationships help entrepreneurs improve new venture performance (Jack et al., 2008), decrease sales volatility (Tuli, 2005) and promote organizational development (Shaw, 2006). Data collected in this study demonstrate that entrepreneurs' knowledge-seeking is sometimes coupled with the processes of developing or maintaining other relationships. One 42-year-old founder in the E-commerce industry noted, "A lot of times I feel like when you're talking about raising capital you don't say that you're going to ask them for money, but you ask them for advice and for feedback" (E2). Knowledge-seeking in this case is used as a strategy to shorten the social distance between entrepreneur and a potential investor. This entrepreneur initiated the conversation by seeking advice, and later by taking the advice, he managed to match the expectation of the knowledge source, which paved way for the establishment of other relationships. Also, the researcher learned from the field data that one common practice in finding a co-founder is to consult the business idea with senior colleague from previous jobs and then through knowledge-seeking, ultimately converting them into co-founders.

In another case mentorship was considered as a possible outcome of the relationship with investors. For example, another founder at the age of 30 noted, "It's not only about the money but if there's a relationship there. Ideally, you want to have somebody invest that can give you knowledge, too, and advise you and mentor you" (E5). Therefore, these findings suggest that developing multiplex relationships could potentially consolidate the processes of seeking knowledge and other tangible resources such as financial, human, and social capital.

Furthermore, multiple interviewees indicated that career guidance from mentors is also highly desired. Previous research showed that entrepreneurs' limited information about entrepreneurship as a career might deter successful market entrance (Sauermann & Roach,

2016). Data from this study suggest that the coaching from mentors about career development might increase the overall quality of entrepreneurial activities. For example, a 28-year-old founder who has run a company since 2018 explains:

> I really appreciate that because they don't only provide feedback on your business, but also on your level of happiness. I think your personal life needs to be very well balanced as an entrepreneur, because if you derail your personal life, it's very, very likely that your professional life will also derail because it's all hanging on you. There's not a corporate umbrella that is holding you and sustaining you. Here if your personal life derails, everything is going to derail eventually. So, mentors know that, and I really do appreciate that they try to ask about your personal life as well. Are you meeting your personal goals, are you fulfilling your expectations, are you currently happy? Obviously, they help you center that and focus on the things that you want out of life. (E10)

As suggested by McPherson et al. (2001), the more diverse the flow between early stage entrepreneurs and mentors, the 'thicker' the relationship. From the preceding quotes we can see that the mentor's caring about personal happiness not only makes the relationship thicker but also helps the founder strike a balance between work and life. Prior research examining the psychological well-being among self-employed and organizationally employed demonstrate that although self-employed persons enjoy greater autonomy and job satisfaction than those employed in organizations, they also report higher levels of work-family conflict and lower family satisfaction (Parasuraman & Simmers, 2001). Therefore, despite all the business-oriented guidance, entrepreneurs also appreciate the advice from mentors in exploring the meaning of work. In general, evidence shows that entrepreneurs take the multiple layers of valuable resources located in networks of relationships into account when engaging with mentors.

Peer Mentorship. Survey data demonstrated that *other entrepreneurs* was rated as the most frequently engaged knowledge source by respondents. More than half of the interviewees also indicated their preferences in seeking advice or mentorship from peer entrepreneurs. One interesting finding from them is that the perceived meaning of 'mentor' is not strictly associated

with the traditional definition as more senior professionals who offer career support. It is more often used "loosely" to refer to peers with whom they exchange knowledge with. For example, one founder remarked, "The closest I think I came to a mentor was another friend of mine who's done a couple of startups. When I say mentor, I use the term loosely. I mean, I ran the idea by him" (E2). Traditional mentorship often implies the asymmetry between mentor and mentee in terms of work experience or social status. However, emerging industries inherently imply an absence of experience. The interview data suggest that there are generally five benefits from obtaining "mentorship" from peer entrepreneurs: learning information relevant to entrepreneurial activities, being motivated by the sharing of pressures and hopes, the prevention of negative perceptions from resources providers, the combining roles of knowledge seeker and contributor, and the exposure to collective feedback.

First, although many mentors in established industries have deep expertise in certain areas, they do not have the same career paths or experiences as those entrepreneurs. Entrepreneurs want to find those who have been in their positions to get relevant knowledge. It is easy to find mentors in traditional industries where tenure equals experience, but it is extremely hard in an emerging industry. For example, a cryptocurrency founder who transitioned from an investment banker to a tech entrepreneur said:

> They weren't going through this nontraditional path. When I was doing something traditional, like working on Wall street, it was easy to find somebody that was maybe a couple years older than me that was where I was…But for these people, the technology portion of the job was new to them. So they didn't know more than me. There wasn't any guidance that they could provide me. (E1)

Sometimes mentors' length of experience can be interpreted as a negative factor for entrepreneurs operating in a new industry. Entrepreneurs perceived that age homophily with

peers will yield a higher likelihood of meaningful interactions so that the advice from younger mentors would be easier to digest. For example, a postdoc founder explained:

> If you look at most of board of advisors or mentors, they tend to be these older people who have a lot of experience in the field. I think there's a lot of value in a mentor from a young ... Someone who's maybe 10 years ahead, not 50 years ahead of you. We don't have anyone like that, and honestly, I think that's just because we're a new industry, so there's not someone who's done what we've been doing for 15 years. (E5)

The preceding quotes suggest that the preference for choosing a younger mentor is determined by the newness of the industry. Another 36-year-old entrepreneur also noted, “I think it depends on the success of our company, right? My friend is only 32 who has a $15 million back startup. I value his feedback rather than somebody who’s a senior business person that’s 50 years old” (E8). The actual experience of the entrepreneurial process as well as the achievement from previous startup experience are more important qualities of a mentor.

Second, while the value of the advice is not based on reputation or tenure in a specific field, the similar priorities in the early business stage as well as the sharing of pressures and hopes prepares entrepreneurs in dealing with knowledge ambiguity. For example, one founder said that he always talks to several “CEO buddies,” who are equivalent in terms of the position and the responsibilities to exchange best practices. The CEO buddies usually had a bi-weekly call and they just talked about how the business is going and what the challenges are. The shared experiences gave them valuable knowledge in all kinds of topics such as finding talent, lawyers and investors. Another 30-year-old entrepreneur described how the shared emotional feeling influences knowledge-seeking processes, “Whereas from a mentor's standpoint, they already climbed the mountain, so they're telling you how the mountain looks. Whereas with your peers, they're telling you how the mountain is. It’s an interesting thing” (E10). The “mountain climbing” analogy indicates that peer founders are just at the same stage as him, on a path of

building their own future with the same passions and fears. Therefore, he felt like there are more ways to connect with them and assist each other.

Third, entrepreneurs also do not want to disclose too many negative emotions, such as doubts about the product and their career path with mentors, especially if mentors are very well-connected with investors or they might be potential investors themselves. For example, one founder expressed the concern that inappropriate information disclosure with reputable or influential mentor might become evidence that they are incompetent and unpromising. This 46-year-old founder explained how he manages his interactions with his mentor:

> It's interesting because you also don't want to reveal too much negative about the business…Everything always has to be okay to the outside, because if it's not, then you run the risk of somebody saying something to somebody, like they're not confident or the business isn't doing that well. So, it's really a struggle as an entrepreneur to find a person that you can really confide in, because it can be a very lonely space. It always has to be perfect or at least the trend line has to be going in the right direction. You can't have cash flow problems, but everybody does. (E2)

The preceding quotes signal the importance of trust underlying the knowledge-seeking process. As mentioned in the sources of knowledge ambiguity, the founder's knowledge-seeking process is often complicated by his or her role as the solo decision-maker and needs to balance the disclosure of information at early stages. Interacting with peer founders offers a more secure and supportive social context to promote the discussion of important but sensitive problems or feelings.

Fourth, in the peer entrepreneur network, each entrepreneur plays both roles as knowledge seeker and knowledge source. The knowledge transfer process is more like two parties learning together by sharing their questions and reflecting upon their experiences. From this sharing and teaching action, entrepreneurs feel empowered and show increased confidence. In contrast, a conversation with a mentor could lead to increased insecurity and doubt, even

though the advice itself is useful. As a 30-year-old female founder of a business service company mentioned:

> With other founders, it's definitely more a two-way street where, even with Devon, we'll spend 50% talking about his business, 50% talking about mine. Not that we were timing it, but it just happens that way. But if I meet with an advisor from Founder Institute, one of the mentors, we are usually spending 80% of the time talking about me and my company. So that's the difference. So, the feeling after meeting with a co-founder, you generally feel like, oh, you took something away and also you feel more empowered because you shared something, right? You taught them something and they taught you something. So, you're feeling, like, yeah, this part they helped me a lot with, but I actually knew a lot about the things I was talking to them about and is kind of a moment of, oh well, I've progressed. So that was helpful and that was fun usually and also, I feel confident. (E12)

From the preceding description of the time spent between communication partners, we can see that the knowledge-seeking is not necessarily a one-way street in the entrepreneurial context. Both the sharing and taking of information comprise the knowledge-seeking process. The experience of knowledge is coupled with entrepreneurs' development of self-efficacy and a sense of progression along the journey.

Last, when seeking knowledge from peers, the format could be more flexible and collective, which in turn promotes knowledge interpretation and decision-making. For example, a founder formed a group of 4 or 5 on Trello with other tech founders and they gathered regularly to discuss their struggles, from practicing pitching to asking recommendation for engineers. (Trello is project management software that people can use to form group projects and keep track of the status.) This founder explained how he compares group feedback with one-on-one feedback:

> The more people the better. Yeah. Because I feel like the one-on-one situation with the one guy was like, "You need to make this a blockchain company." And I don't agree with that. So, if somebody else is in the room, like three other people are like, "Yeah, you need to make this a blockchain company," I'd be like, oh, I would put more weight to it. (E8)

The advantage of using this collective peer mentorship is that the feedback will carry more weight and the consensus from the group will push the entrepreneur to think about the problem more objectively. In contrast, in one-on-one mentorship, the feedback is more likely to be ascribed to a difference of interpretation or preference. The size of the feedback group really "changes the dynamic."

Extended Advice Networks. In recent years, research on mentorship has started to shift from focusing on the traditional hierarchical relationship between a high-status and a junior member to the study of "multiple, short-term developmental relationships stemming from different social realms" (Chandler & Kram, 2007; Cotton et al., 2011, p. 16; Noe, Greenberger, & Wang, 2002). Parker, Arthur, and Inkson (2004) used the concept *career communities* to refer to the "self-organizing member-defined social structures through which individuals draw career support" (p. 489). This concept was developed under the effect of the new economic environment with a changing labor market (Cappelli, 1999) and increasing reliance on the creation and sharing of new knowledge (Senge, 1997). In this new environment, individuals are taking greater responsibility for setting their own goals and managing their own careers (Parker et al., 2004). Entrepreneurs are expected to seek developmental support (e.g. mentoring, support, and advice) from a diverse range of social groups, such as former companies, professional associations, industry networks, regional communities, ideological connections, project collaborators, alumni, family, and virtual relationships (Cotton et al., 2011; Cummings & Higgins, 2006).

Similar to the idea of leveraging self-organizing communities for career support, entrepreneurs in this study mentioned the use of extended advice networks for seeking entrepreneurial knowledge. An extended network consists of key stakeholders including

advisors, investors, peer founders, etc. but usually excludes customers. With busy schedules, entrepreneurs constantly need to balance the time invested in seeking information as well as the quality of the information received. Sending a monthly newsletter thus becomes a common practice among entrepreneurs to engage with investors or mentors. For example, one startup founder who runs a company focused on AI noted:

> We are really good at sending out monthly update emails or bimonthly update emails. And that usually had specific things that we tuned for our extended network. So like we are looking for help with this, or introductions here, or so on. We usually had a pretty good response rate. And that went to about 60 people who are not customers but are extended friends of, we call it the friends of list. And then we'd get help in various domains from that email. And usually if we asked like we want this, this, and this at least two of those things we'd get responses of people who could either help us or refer us to someone who could help us or send us like a book or something. (E19)

The preceding quote indicates that through forming extended advice networks, the founder not only shortened the time spent coordinating with different parties, but also maximized the network brokerage function of mentors or their "friends of list." Based on the survey data on relational multiplexity (see Figure 26 in next section), "referral to other contacts and resources" was reported as the most recognized benefit entrepreneur could gain from mentorship (69 out of 80 responses). Therefore, short-term mentorship with extended knowledge networks could effectively help achieve the goal of broadening social networks without a significant amount of relationship maintenance investment.

In summary, data in this dissertation demonstrate that entrepreneurs tend to balance the accessibility and capability of the mentors and focus on the development of multiplex relationship with them. Entrepreneurs' interactions with peer founders and extended advice networks has two advantages over traditional mentorship in offering an emotionally resonant and efficient knowledge-seeking experience.

Media Multiplexity and Mentor Engagement

Survey questionnaire data was employed to explore early stage entrepreneurs' communication patterns when engaging with mentors, focusing specifically on media multiplexity. Descriptive statistics are first discussed below followed by inferential statistics and regression results.

Descriptive statistics and inferential statistics. Descriptive data in *Figure 24* demonstrated that meeting face-to-face, email, and phone calls were the three main channels for entrepreneurs to engage with mentors. Instant/text messaging platforms such as WhatsApp and social media such as Twitter were similar in usage. Video chat and collaboration tool such as Slack were less popular between entrepreneurs and mentors.

From *Figure 25* one can see that referral to other contacts or resources was listed by approximately 86% of the respondents as the benefit from mentorship relationship. It showed that network brokerage function was the most valued feature of mentors in an entrepreneurial context. Over 60% of the respondents listed social support, general industry information, specific business skills, and career advice as the resources they gained from their mentor. Approximately 38% of the respondents also indicated that their mentor plays an investor role for their businesses. These data corresponded to previous findings that entrepreneurs regard advice and investment as intertwined functions of mentors.

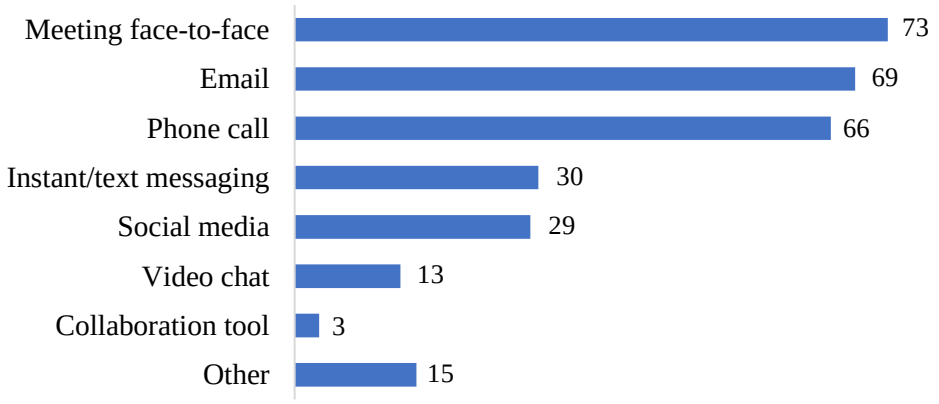


Figure 24. The Media Entrepreneur Use to Communicate with Mentor *(N=80)*

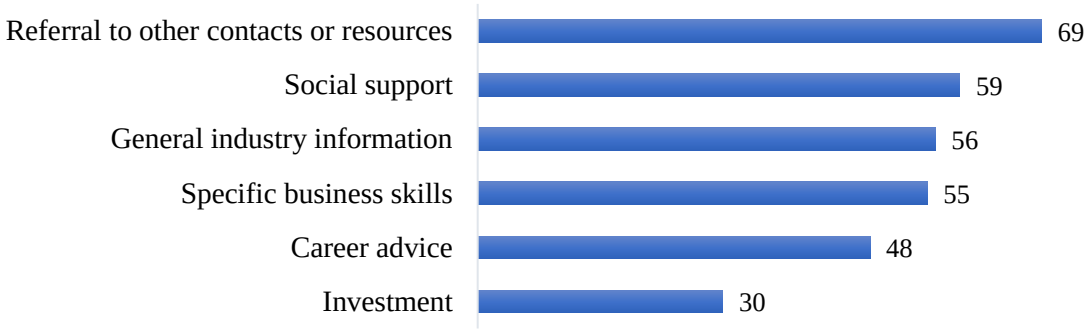


Figure 25. The Types of Resources Entrepreneur Gained from Mentor *(N=80)*

Descriptive analysis (see Table 13) demonstrated that using three communication channels (32%) was the most common practice between entrepreneur and mentor. About half of the entrepreneurs indicated that they used four or more communication channels to engage with mentors. Less than 20% of the respondents used two channels or less for communication. According to Table 14, we can see that more than 96% of the respondents received more than one type of resources from mentorship relationships. About 60% of the respondents gained four or more types of resources from their mentors.

Table 13

Number of Communication Channels Used by Entrepreneur and Mentor (N=80)

Number of media used	Percentage of respondents (*n*=80)
1	7.3%
2	12.2%
3	31.7%
4	20.7%
5	14.6%
6	9.8%
7	2.4%

Table 14

Types of Resource Exchanges between Entrepreneur and Mentor (N=80)

Types of resources gained	Percentage of respondents (*n*=80)
1	3.7%
2	14.8%
3	22.2%
4	29.6%
5	21.0%
6	8.6%

The influence of knowledge sources on engagement behaviors. All the participants were given the same set of questions with only the wording differences on mentor or person. Appendix A-2 shows the summary of intercorrelations, means and standard deviations for variables.

A one-way ANOVA was conducted to examine the mean differences of relational multiplexity, media multiplexity, knowledge acquisition and tie strength between people who have mentors, do not have mentors and those not sure about whether they have mentors. The results suggest that there was a significant effect of the recognition of knowledge source as mentor on engagement behaviors and knowledge acquisition for the three conditions.

The analysis on relational multiplexity was statistically significant, $F(2, 100)=3.38$, $p=.038$. Post hoc comparisons using the Tukey HSD test indicated that participants reported higher level of relational multiplexity when engaging with their mentor ($M=3.73$, $SD = 1.29$) or someone likely to be their mentor ($M= 4.00$, $SD=1.63$) than with those they do not consider as a mentor ($M=2.90$, $SD= 1.41$). The analysis on media multiplexity was also statistically significant, $F(2,100)=3.65$, $p=.030$. Participants have higher levels of media multiplexity when engaging with their mentor ($M=3.61$, $SD = 1.48$) or someone likely to be their mentor ($M= 3.75$, $SD=1.71$) than with those they do not consider as a mentor ($M=2.60$, $SD= 1.60$). Similarly, the analysis on knowledge acquisition was also statistically significant, $F(2,100)=3.60$, $p=.031$. Participants reported more effective knowledge acquisition when engaging with their mentor ($M=4.38$, $SD = .62$) or someone likely to be their mentor ($M= 4.56$, $SD=.52$) than with those they do not consider as a mentor ($M=3.96$, $SD= .81$).

Taken together, these results suggest that whether people have a mentor or not really did have an effect on their engagement behaviors, in regard to the use of communication channels

and diversity of resources exchanged, as well as the effectiveness of knowledge acquisition. In addition, although some participants reported that they were not sure whether they have mentor, their behaviors with the knowledge source were consistent with those who engage with a mentor. Since this study focuses on mentor engagement, 20 cases with people who do not have mentor were excluded from this analysis, resulting a total data of 80 for the following analysis.

In order to understand whether people have mentor or not is associated with their prior startup experience, an independent t-test was performed. Results show that entrepreneurs who have a mentor had more startup experience (M=.50, SD=.50) than those who do not have a mentor (M=.30, SD=.47). However, this difference was not statistically significant, t(30.83)=1.68, p=.10. Therefore, there was no confounding effect of startup experience on entrepreneurs' media use and knowledge acquisition from mentors. Table 15 shows the one-way ANOVA results.

Table 15

One-way ANOVA of Media Multiplexity, Relational Multiplexity, Knowledge Acquisition and Tie Strength by Knowledge Source (N=100)

Variable	Have mentor (n=77)		Don't have mentor (n=20)		Not sure (n=3)		df	t	F	*P*
	M	*SD*	M	SD	M	SD				
Relational multiplexity	3.73	1.29	2.90	1.41	4.0	.78	2	.83*	3.38	.04
Media multiplexity	3.61	1.48	2.60	1.60	3.75	1.71	2	1.01*	3.65	.03
Knowledge acquisition	4.38	.61	3.96	.81	4.56	.52	2	.42*	3.60	.03
Tie strength	3.91	.76	3.80	1.04	3.13	1.32	2	.11	1.67	.19

*p<.05, **p<.01, ***p<.001

Media multiplexity, tie Strength and knowledge acquisition. Conditional process model 4 (see *Figure* 13 (b)) was used to investigate the relationships among media multiplexity, tie strength, and knowledge acquisition. Results indicate that media multiplexity significantly predicts tie strength, B= .21, t= 3.80, p<.001 (see *Figure 26*). The R^2 value suggests that media multiplexity explained 26% of the variance in tie strength. The positive relationship reveals that the greater number of media used by entrepreneurs in communicating with mentor, the stronger the social relationship between them. Thus, H_{11} was supported. Media multiplexity was found statistically positively associated with knowledge acquisition, B=.40, t=4.07, p<.001. H_9 was supported. However, tie strength did not significantly predict knowledge acquisition, B=.21, t=1.12, p>.05. H_{10} was not supported. The R^2 value shows that the model explains 32% of the variance in knowledge acquisition. As entrepreneurs uses more media to engage with mentors, their knowledge acquisition is more effective. H_{12} stated that tie strength mediates the relationship between media multiplexity and knowledge acquisition. Since tie strength was not a significant predictor of knowledge acquisition, the results do not support the mediational hypothesis of H_{12}. Table 16 shows the results of the model.

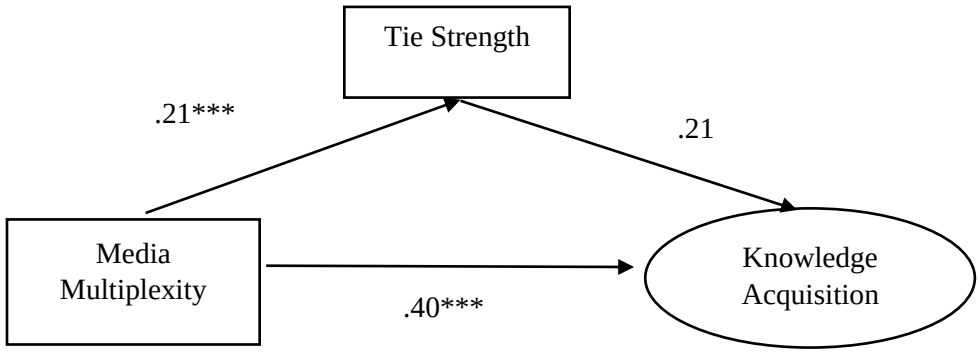


Figure 26. Hypothesized Model of Media Multiplexity and Knowledge Acquisition with Results
*p< .05, **p< .01, ***p<.001

Table 16

Mediation Effects of Tie Strength on the Relationship between Media Multiplexity and Knowledge Acquisition (N=80)

Regression paths	B	*t*	*p*
Mediation a path (media multiplexity on tie strength)	.21***	3.80	.00
Mediation b path (tie strength on knowledge acquisition)	.21	4.24	.27
Total effect, c path (media multiplexity on knowledge acquisition, no mediator)	.45***	.08	.00

Note. B = unstandardized coefficient; CI = confidence interval.
**$p < .05$, **$p<.01$, ***$p < .001$

Media multiplexity and relational multiplexity. A sequential linear regression was performed to examine how relational multiplexity was predicted based on media multiplexity, while controlling for initial differences in gender, age, education, organizational size and total capital raised. H_{13} stated that the more communication channels entrepreneurs used to engage with mentors, the more types of resources they will gain from the mentorship. In other words, an increase in media multiplexity is predicted to be positively associated with the development of relational multiplexity between entrepreneur and mentor. Table 17 shows the unstandardized regression coefficients (B) and intercept, the standardized regression coefficients (b), R^2 and adjusted R^2 after entry of all the independent variables in two steps.

Table 17

Sequential Multiple Regression Analyses Predicting Relational Multiplexity (N=80)

Variable	Model 1	Model 2
Org size	-.16	-.14
Total capital raised	.14	.10
Education	-.11	-.14
Age	-.03	-.12
Gender	-.49	-.09
Media multiplexity		.49***
ΔR^2	-	.24
R^2	.07	31

Note. unstandardized beta coefficients are reported
*p<.05, **p< .01, ***p< .001

Model 2 (R^2=.31, F (6, 73) =5.33, p< .001) shows a statistically significant increase in R^2 compared to Model 1, suggesting that Model 2 has a better overall fit than Model 1. The R^2 change for Model 2 was .23. There was a positive and statistically significant relationship

between media multiplexity and relational multiplexity (B= .45, p<.001) (see Figure 27), indicating that the more number of media channels entrepreneurs use to communicate with mentors, the more diverse the resources they gain from the relationship. This was consistent with the assumption that medial multiplexity promotes the development of multiplex relationships. Therefore, H_{13} was supported.

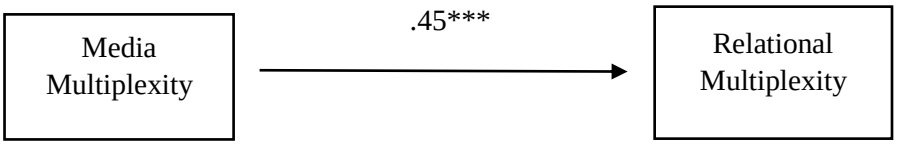


Figure 27. Hypothesized Model of Media Multiplexity with Results (***p< .001)

Predictors of media multiplexity. Sequential linear regression was then performed to see how well media multiplexity could be predicted based on variables of demographic similarity, proximity, trust, perceived value, and social embeddedness. Model 2 (R^2=.34, F (5, 69) =2.69, p< .01) shows a statistically significant increase in R^2 compared to Model 1, suggesting that Model 2 had a better overall fit than Model 1. The R^2 change for Model 2 was .22.

H_{14} argued that there is a negative and significant relationship between age dissimilarity and media multiplexity. The result shows that B= -.92, p<.05, indicating that the less difference between entrepreneur and mentor in age, the more likely they employ multiple communication channels for interaction (see Figure 28). Thus, H_{14} was supported. Next, H_{15} stated that gender dissimilarity negatively predicts media multiplexity. This hypothesis was not supported as B= -.81, p>.05, suggesting no significant relationship between these two variables. Following this, H_{16} argued that ethnicity dissimilarity also negatively predicts media multiplexity. Results

showed that B= -.71, p<.05, revealing that entrepreneur use fewer media channels to communicate with mentor of different ethnicity. Thus, H_{16} was supported.

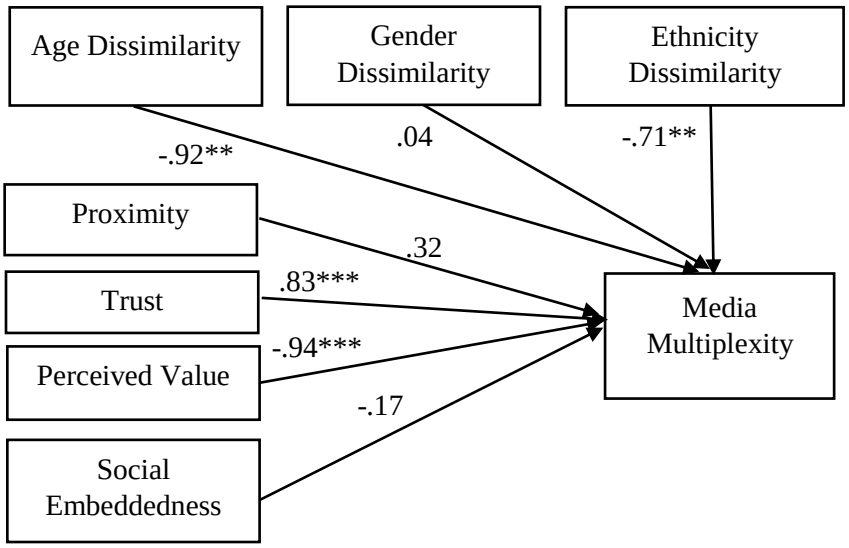


Figure 28. Hypothesized Model of Predictors of Media Multiplexity with Results
*p< .05, **p<.01, ***p< .001

Subsequently, H_{17} stated that entrepreneurs will use more media to communicate with mentors who are geographically closer to them. This hypothesis was not supported, B=.32, p>.05. According to H_{18}, entrepreneurs will use more media channels to communicate when they have higher level of trust with the mentor. The result (B=.83, p<.01) supports this hypothesis. H_{19} predicted that perceived value is associated with media multiplexity. The results (B=-.94, p<.01) show that this hypothesis was not supported. Contrary to our prediction, entrepreneurs tend to use fewer media channels to engage with mentor when the perceived value is high. H_{20} argued that when entrepreneur and mentor have more layers of social relationships, they will use more media channels. The result does not support this hypothesis, B= -.17, p>.05. This result indicates that the layers of social circles, including affiliations and mutual connections, was not a

significant predictor of media use. Table 18 shows the model summary and Appendix A-3 shows the correlations among variables.

Table 18

Sequential Multiple Regression Analyses Predicting Media Multiplexity (N=80)

Variable	Model 1	Model 2
Org size	.00	-.05
Total capital raised	.11	.06
Education	.24	.18
Age	-.46*	-.08**
Gender	-.1.02*	-.81
Age dissimilarity		-.92*
Gender dissimilarity		.04
Ethnicity dissimilarity		-.71*
Proximity		.32
Trust		.83**
Perceived value		-.94**
Social embeddedness		-.17
ΔR^2	-	.22
R^2	.12	.34

*p< .05, **p<.01, ***p< .001

Chapter 9

Moving Forward: Summary and Implications

Communication occupies a central role in the entrepreneurial process. Communication is a critical resource in that it allows entrepreneurs to act creatively and efficiently in the marketplace through new venture activity (Kirzner, 2015). More importantly, communication is one key way in which an entrepreneur obtains knowledge from his or her network. In order to better understand the process of entrepreneurial communication, this dissertation has built on interdisciplinary scholarship and first-hand data from entrepreneurs to examine the ways knowledge-seeking is accomplished in emerging organizations. The research presented in this dissertation focuses on the NYC metropolitan area as the social context, and in doing so, highlights the development of a booming ecosystem of entrepreneurship with strong growth in technology-oriented sectors. The purpose of this dissertation was to identify the knowledge-seeking processes that explain, rather than merely describe, how early stage entrepreneurs mobilize resources to overcome the liability of newness, which has long been argued as a significant trajectory of entrepreneurship research (Low & MacMillan, 1988).

First, I examined the factors leading to knowledge ambiguity in the entrepreneurial context, as well as how entrepreneurs manage their communication behaviors to either mitigate the negative effect of knowledge ambiguity or to leverage knowledge ambiguity to gain access to resources. Second, I analyzed the prior experience and communication behaviors of entrepreneurs in order to understand how people's knowledge-seeking behaviors are enabled or constrained by the cognitive capacity developed through prior experience. Third, I examined mentorship as a specific knowledge-seeking relationship between entrepreneurs and mentors in order to shed light on the outcomes and antecedents of media use. The following section

summarizes the key findings from each section of this dissertation, focusing on the theoretical and practical implications, as well as avenues for further research.

Knowledge Ambiguity and Entrepreneur's Coping Strategies

The level of uncertainty that entrepreneurs are required to deal with is far greater than that of managers in traditional, hierarchical and established organizations. Entrepreneurs have to make judgements and decisions with limited historical data and scarce information regarding how the market will respond to new products (Busenitz & Barney, 1997). In entrepreneurial context knowledge is not judged by absolute quality – it is more about relevance and appropriateness of the knowledge in facilitating decision making. First, sources of knowledge ambiguity were introduced by drawing upon 20 interviews with early stage entrepreneurs regarding the knowledge that is important to the activities that lead to organizational growth. Additionally, results from the open-ended survey questions are summarized at the end of this section to provide additional characterization of the sources of knowledge ambiguity.

Sources of knowledge ambiguity. Prior research suggests that the tacitness of information (Van Wijk et al., 2008), the contextual specificity of knowledge (Thompson & Walsham, 2004), the tie strength between the knowledge seeker and knowledge source (Leonardi & Meyer, 2015), and the competence of knowledge seeker (Cohen & Levinthal, 2000) are the main reasons leading to knowledge ambiguity. Findings in this dissertation suggest that the complexity of knowledge, complexity of roles and responsibilities, environmental factors, and emphasis on the legitimacy of knowledge seeker are four main sources of knowledge ambiguity in the early entrepreneurial context. Although some of the findings are compatible with the dimensions indicated in prior research, there are several areas in which the findings from this

study differ from traditional intra-organizational settings or inter-organizational settings between established businesses.

The findings about the complexity of knowledge are generally in line with concepts of ambiguity and causal ambiguity originating from a nascent market with limited available norms and practices (Law, 2014). On one hand, the newness of a market increases the tacitness of information when entrepreneurs attempt to communicate their ideas and when they try to seek feedback from the stakeholders or core markets. On the other hand, the fact that many emerging industries are of a hybrid nature–mixing two or more fields–leads to more interdependencies between the processes of conceptualization and operation, thus causing a higher degree of causal ambiguity. Since each industry has its own set of rules and resources, the combination of knowledge becomes abstract and sticky, and this combination requires engagement from multiple parties for negotiation and co-creation of knowledge.

Entrepreneurs' roles and responsibilities tend to interfere with the knowledge-seeking process. Findings from prior research on power and status are less relevant for emerging organizations as entrepreneurs are usually operating alone in an organization or with a very small team of individuals. However, the entrepreneur's critical role as decision maker was identified as a significant factor influencing the way they manage their knowledge-seeking behaviors and their perceptions of the knowledge received. For example, entrepreneurs' visions play a crucial role in guiding all the developmental activities, but the short-term priorities of operating an organization often are more practical and pressing. This balance of priorities leads to a strategic choice of the knowledge needed provided entrepreneurs' limited time schedule. In addition, entrepreneurs must constantly evaluate the impact of their information disclosure on the perception that others have from the external environment. The intentional withholding of

information to prevent negative interpretation of entrepreneurs' motivations and capabilities reduces the opportunity of receiving knowledge as well as the quality of the information received. The integration of knowledge-seeking behaviors and decision-making in this theme suggest the need to further explore how entrepreneurs adapt to external environment through managing the flow of information.

The environmental factors identified in the first section highlight the differences between knowledge and social systems in exerting influence on the access and interpretation of knowledge. Entrepreneurs' external networks include customers, suppliers, investors, government institutions, partners, and the like (Yli-Renko et al., 2001). When interacting with this network of stakeholders, entrepreneurs experience different conduct and expectations. Moreover, audiences' stereotypes of certain fields usually prohibit effective two-way communication about emerging knowledge. Understanding the individual's knowledge-seeking behaviors requires knowledge about how stakeholders in the ecosystem collaboratively construct the contextual entrepreneurial knowledge.

Lastly, without organizational structures to facilitate knowledge transfer, knowledge sources (e.g. investors, mentors) often have limited understanding about entrepreneurs' background, expertise and motivations. Therefore, to maximize the efforts spending in sharing knowledge, these knowledge sources heavily rely on third parties to quickly construct an image of the knowledge seekers. The role of intermediaries, such as mutual contacts and social affiliations, is indispensable to effectively build connections between entrepreneurs and stakeholders. In the absence of these intermediaries, entrepreneurs encountered tremendous difficulties in attracting knowledge sources' attention. Thus, the legitimacy of the knowledge seeker intervenes in the knowledge transfer process from the very beginning.

Knowledge ambiguity coping strategies. The exploration of how entrepreneurs respond to knowledge ambiguity, presented in this dissertation, extends understanding of the cognitive processes of entrepreneurs such as the way they think and make decisions. Through analyzing the way entrepreneurs utilize media channels and engage with knowledge sources, this part sheds light on the communicative power of early stage entrepreneurs to overcome the barriers of accessing knowledge. This section focuses on the agentic behaviors of entrepreneurs in coping with knowledge ambiguity. In general, six strategies emerged from the interview data: optimization of information relevance, enhancement of communication efficiency, changes in public visibility, increases awareness of knowledge, access to indirect knowledge, and specialization within teams. Some of these themes can be explained by theories such as social presence theory and affordance theory, while others point to new directions for theorization.

Optimization of information relevance. Social media was used as an effective tool for entrepreneurs to understand knowledge sources and the knowledge itself, as well as to access conversational materials to prepare for the actual knowledge transfer. In addition, entrepreneurs also leverage the strength of social media in providing contextual knowledge to facilitate decision making. Furthermore, community-based use of media was a common practice among founders to enhance the relevance of information. Social influence theory predicts that organizational settings and work groups strongly influence individual's media use regardless of task demands (Fulk & Boyd, 1991). The content of the knowledge and the meanings people attach to knowledge are products of social influence processes, which are always communicative (Kuhn, 2014). In general, through developing ambient awareness and understanding the potential impact of information, entrepreneurs were able to concentrate on seeking the information essential for their new ventures.

Enhance communication efficiency. According to social presence theory, communication is effective as long as the communicators select the medium that has the appropriate social presence required for interpersonal engagement. Data in this dissertation show that face-to-face communication is the most important channel for complex knowledge transfer since it offers the flexibility in proposing alternatives and meaning co-creation, particularly when multiple stakeholders are involved. The flexibility of face-to-face communication also manifests from entrepreneurs' less-perceived time constraint, which tends to contribute to more opportunities for knowledge transfer. Visual communication is another way to assist in managing knowledge ambiguity because visual cues are especially valuable when the feedback is vague. Last but not least, email communication prepares both parties for more meaningful in-person and visual conversation by building the agenda with extensive information updates. Overall, given the same level of knowledge ambiguity, an increased amount of knowledge helps entrepreneurs make better decisions.

Change in public visibility. In an emerging industry, the identification of key knowledge sources was reported by the respondents as a major barrier in the knowledge-seeking process. Thus entrepreneurs utilized the power of the visibility and transparency of social media to reverse the knowledge searching process. The transparency of social media reduces the efforts required for knowledge-sharing (Bregman & Haythornwaite, 2001) and the visibility of social media affords people the opportunity to turn tacit knowledge into explicit knowledge in order to demonstrate competency (Huh et al., 2007). Through personal branding online, entrepreneurs are first using the knowledge they have to attract the attention of key knowledge sources. When knowledge sources emerge from the audiences, entrepreneurs can then obtain the knowledge they need. Similarly, participating in offline conferences, meetups, or startup competitions leads

to a higher chance of serendipitous encounters, thus contributing additional opportunities for knowledge transfer.

Increase awareness of knowledge. Prior research indicates that when the knowledge seeker has limited cognition of the knowledge needed, knowledge ambiguity is likely to result (Cohen & Levinthal, 2000). Knowledge complexity poses higher demands for knowledge seekers to identify the language and semantics to express his or her needs (Szulanski, 1996), as well as to ask good questions (Leonardi & Bailey, 2008). One approach used by respondents in this study to mitigate the negative impact of limited experience in the field was to enlarge their search for knowledge by attending offline meetups, using social media, and other online information channels. Through enhancing the ability to interpret and integrate information, entrepreneurs were able to reduce component ambiguity.

Access to indirect knowledge. The newness of a market implies that there are fewer opportunities for entrepreneurs to imitate successful practices and directly assimilate transferrable skills. Therefore, respondents in this study pointed out the significance of accessing indirect knowledge from personal reflection, peer entrepreneurs' problem-solving process, or startup "celebrities" to cope with the uncertainty and complexity of knowledge. Although no direct knowledge transfer occurred in this process, entrepreneurs were able to complete the knowledge-seeking process based on their own perceptions without knowledge sources' awareness or involvement.

Specialization within team. Consistent with transactive memory theory, which is applied widely in intra-organizational settings, all of the entrepreneurs in this study who had a founding team described the specialization of knowledge-seeking tasks with team members. Observational data showed that investors tend to prefer investing in a founding team over a solo founder mainly

for three reasons: a team will have complementary skills, a team is more likely to achieve founder-market fit, and the business idea will be more likely to be relevant to the team's background. Therefore, by breaking down tasks, founders and co-founders enjoy advantages coping with specific knowledge area thus reduce the overall perception of ambiguity.

Overall the qualitative findings about how entrepreneurs cope with knowledge ambiguity generally correspond to the five categories of challenges in obtaining the desired knowledge from the questionnaire data. The results from the open-ended survey question demonstrates that lack of access was considered the biggest challenge, following by the difficulty in distilling information, assessing information reliability, staying aware of the existence of knowledge, and the lack of time for searching information. The insufficient metaknowledge about what is the knowledge needed, how to obtain it, and how to ensure its relevance and quality are the key concerns.

Prior Experience, Communication Behavior and Knowledge Access

Based on survey responses from early stage entrepreneurs in the NYC metropolitan area, this research unpacks the roles of prior experience on knowledge-seeking, with a focus on the dimensions of prior experience. Entrepreneurs approach the startup process with a 'stock of experience,' consisting of the background or history that has accumulated up to that point (Reuber & Fischer, 1999). The unique range of accumulated skills and abilities from prior experience shapes the level of 'entrepreneurial preparedness' (Harvey & Evans, 1995) and helps develop an 'information funnel' through which the entrepreneurs' attention is filtered (Bettis & Prahalad, 1995). The findings show that prior experience should not be considered as an overarching concept mixing different aspects of experience.

The influence of startup experience. Similar percentages of people with and without startup experience were included in this sample, with 48% of the respondents representing novice entrepreneurs and 52% representing veteran entrepreneurs. The quantitative analysis of the influence of prior startup experience on entrepreneurs' current communication behaviors shows that for veteran entrepreneurs who sets up a series of businesses, either in parallel or sequentially, they are more likely to use a diverse range of online media channels such as Twitter, blog, etc. to access entrepreneurial knowledge. These experienced entrepreneurs not only reported easier access to knowledge but also disclosed higher knowledge explicitness. The difference in knowledge experience indicates that prior startup experience provides people better awareness of the storage of information and equips them with higher cognitive ability to interpret the information.

Divergent influence of the breadth and relatedness of prior experience. Knowledge-seeking behavior, as well as the perceived access to knowledge, can be bounded by an entrepreneur's knowledge of how to process information and his or her ability to make judgment about the appropriate amount of information needed (Woo, Folta, & Cooper, 1992). The findings in this dissertation indicate that relatedness of prior experience exerts a significant and negative influence on entrepreneurs' knowledge access while breadth of experience does not significantly predict perceived knowledge access.

Breadth of prior experience captures the range of an entrepreneur's past work experience across different industries, organizations or functional areas (Stam, 2010). Approximately 40% of the respondents in this study either had no work experience or had a single area of experience prior to their current startup. However, the findings show that entrepreneurs with narrower career

paths in a single knowledge domain or with no working experience were no less likely to access critical entrepreneurial knowledge than those with multiple areas of experience .

Relatedness of experience captures entrepreneurs' knowledge of market developed from prior work experience. While such relatedness of experience opens up opportunities for resource access and context awareness, the findings suggest that closely related experience may not necessarily lead to better perceived knowledge access. The fact that entrepreneurs with less relevant experience tend to report easier access to knowledge implies the constraining influence of prior experience. Firstly, the agentic view of the entrepreneur stresses that although previous industry exposure determines entrepreneurs' initial knowledge networks, such exposure does not warrant the assumption that entrepreneurs can effectively leverage these connections for accessing new knowledge.

Secondly, the behavioral perspective points out that entrepreneurs operating in a similar industry tend to follow more complicated decision models to conduct knowledge searches with higher aspiration levels (Gaglio, 1997). Although people with higher levels of expectation of knowledge tend to exhibit more active searching behaviors (Clough et al., 2018), it should not be taken for granted that such expectations will necessarily lead to better knowledge access. As shown in the results of the first part of the dissertation, knowledge-seeking is often coupled with decision-making processes. Knowledge access sometimes is not judged by the absolute quality of the information, but the outcomes it leads to.

Thirdly, entrepreneurs' self-reported difficulty of knowledge access might be correlated with their cognitive constraints in generating, identifying, and retrieving knowledge. Highly relevant industry or functional experience might lead to liabilities such as over-confidence, subject to blind spots, and illusion of control which may restrict their knowledge search behavior

(Ucbasaran et al., 2001). One interviewee described how he evaluated his potential co-founders' prior experience: "we've been meeting a lot of people who've never worked in [the pharmaceutical industry] before. And I kind of like that, because the longer you've worked in an industry, the more set in your ways you become." Since this founder's company offers a radical technology trying to change the way drug discovery is done, he values people's capacity to learn in a new environment rather than directly apply previous knowledge into new context. Overall, the negative impact of experience relatedness on knowledge access aligns with the initial hypothesis.

The role of knowledge explicitness. When knowledge is tacit, the components of knowledge are usually abstract and complex, such that they escape people's recognition, making the desired knowledge ambiguous to both knowledge seekers and knowledge sources (Law, 2014). The findings from this dissertation show that knowledge explicitness exacerbates the perceived access to knowledge for entrepreneurs with prior experience that is closely related to their prior jobs. Entrepreneurs were actually more likely to report a high level of difficulty in accessing knowledge when entrepreneurs they felt that a variety of written information about entrepreneurship was provided in a thorough and easy-to-understand way. In other words, when knowledge is well-codified, the disadvantage of having related prior experiences creates increased challenges with regards to knowledge access. For one, when knowledge is widely accessible, people with extensive industry background or highly transferrable skills may be more critical about the knowledge received. Alternatively, the perceived difficulty of knowledge access might originate from entrepreneurs' overreliance on prior experience. When people become entrepreneurs after a long history operating in similar contexts, their familiarity with a

knowledge domain might prevent them from making inferences based on the updated and new knowledge.

Prior experience and knowledge network engagement. The measure of knowledge networks in this dissertation includes key stakeholders who provide information or resources directly or indirectly to entrepreneurs such as friends, mentors, investors and research institutions. While previous research claims that the length of experience determines the way an entrepreneur is able to leverage his or her social networks (Janicik & Larrick, 2005), it is further shown here that both the diversity of experience and the relatedness of experience influence the frequency of knowledge network engagement. Entrepreneurs with broader prior experience accumulate a wider array of skills and relationships, which enable them to initiate new network ties with higher level of confidence and social competence compared to those with a single career or knowledge domain concentration. Entrepreneurs are more confident when they engage with their networks and incorporate up-to-date and accurate information into their decision-making processes (Forbes, 2005). Although knowledge network engagement was not found to be associated with easier knowledge access, findings in this dissertation highlight the disadvantageous position of novice entrepreneurs in soliciting information from stakeholders, especially for those student founders with no industry experience at all, or entrepreneurs starting a new organization in an unfamiliar context.

User-generated media for knowledge access. The examination of media use focuses on the frequency of online media use, especially the use of user-generated media in obtaining entrepreneurial knowledge. A list of social networking sites, public forums, and personal websites was included in the survey. Abundant information and knowledge "embedded in the Web in the form of data, metadata, user participation and creating links between these"

(Wunsch-Vincent & Vickery, 2006b, p. 8) comprise the user-created content. Entrepreneurs' media use was found to significantly predict perceived knowledge access. Early stage entrepreneurs who frequently used a combination of online media channels reported easier access to entrepreneurial knowledge. Indeed, user-generated media platforms allow entrepreneurs to produce original content, participate in community discussion, or simply consume information. They drastically increase entrepreneurs' exposure to knowledge resources and their ability to interpret knowledge by learning how to make sense of things from their peers. Taken together, the findings shed light on the interpretation of prior experience as well as the significance of prior experience in influencing entrepreneurs' communication patterns and their knowledge-seeking experiences.

Mentor Engagement and Media Multiplexity

The last section utilized a combination of 20 interviews and 80 survey data to explore how entrepreneurs approach the concept of mentorship and how they communicatively develop the relationship with mentors. This section starts by discussing the trends of mentor selection and engagement, then moves to the patterns of entrepreneur-mentor dyadic relationship, and finally discusses the consequences and antecedents of media multiplexity.

While prior literature has provided tremendous insights on mentor functions in organizations, findings in this dissertation suggest that the balance of accessibility and capability, as well as the potential to develop relational multiplexity are two main considerations. With limited time and resources, knowledge seeking is not a simple task with the direct information transfer from mentor to entrepreneur. Knowledge seeking is a contingent process depending upon many factors, such as the mentor's time commitment, flexibility of the relationship, and the potential to gain other resources preceding or following the exchange of knowledge.

The significance of peer mentorship emerged from both interview and survey data. Interactions between entrepreneurs, including those interactions that encourage the discussion, investigation, and evaluation of entrepreneurial ideas, are critical for product innovation (Biais & Perotti, 2008). Findings in this dissertation reveal that seeking knowledge from peers usually also involves a similar amount of knowledge contribution from the knowledge seeker, and thus it is this exchange process that offers entrepreneurs self-efficacy and confidence. In addition, the sharing of pressures and hopes among entrepreneurs is absent when entrepreneurs interact with mentors without startup experiences. As implied in this research, peer entrepreneurs often have better understanding of the roles and responsibilities specifically in the entrepreneurial settings. Overall peer mentorship enables early stage entrepreneurs to pursue knowledge-seeking in a more secure and supportive social environment. The structurally equivalent positions among entrepreneurs augment their knowledge-seeking from each other.

According to survey data collected in this study, face-to-face meeting (91%), email (87%), and phone call (83%) were listed as the predominant ways of communication between entrepreneurs and mentors, more than double the number of using instant/text messaging and social media. Less than 1% of the entrepreneurs in this study use collaboration tool such as Slack in engaging with mentors. Entrepreneurs who used three or four media channels for engagement account for the largest percentage (52%). Approximately 26% of the respondents used four or more channels. Only 7% of the respondents rely on single channel for communication. Network brokerage (87%) was considered the most common resource offered by a mentor, followed by social support (74%), and industry knowledge (70%). In regard to the concept relational multiplexity, the exchange of four or more types of resources accounts for approximately 70% of the total sample. Less than 4% of the entrepreneurs sought only a single category of content from

their mentors. It is apparent based on these results that the entrepreneurs who were interviewed in this sample tends towards media multiplexity and relational multiplexity.

Different engagement behaviors depending on knowledge sources. One central observation from the survey data was that when respondents recall their engagement with either a mentor (or a potential mentor) or a knowledge source, their reported engagement behaviors were different. The media use for communication with a mentor (or potential mentor) was significantly more intense than media use with a knowledge source where a mentorship relationship did not exist. For those who were not sure about the concept of a mentor, their uncertainty about the role of their knowledge source could be explained by their informal nature of the relationship. Interview data also showed that when the role of the knowledge source was different from the traditional image of a mentor, entrepreneurs might be unsure about the nature of the relationship. For example, one interviewee suggested that asking for advice from peers might create a situation that is less likely to be perceived as mentorship than consulting with senior managers. Overall, the benefit of having a mentor and maintaining a mentorship relationship is salient: entrepreneurs not only receive more resources from their mentors, but also have more effective knowledge acquisition as a result of the mentor-mentee relationship.

Consequences of media multiplexity. In line with previous findings, it was found that media multiplexity is significantly and positively associated with tie strength. In addition, the findings show that media multiplexity is also significantly and positively related to knowledge acquisition. The more diverse types of media channels adopted for communication between the entrepreneur and mentor, the better perceived knowledge acquisition as a result of the relationship. While previous studies have generally emphasized the role of media multiplexity in relationship development, its impact on knowledge acquisition advances the understanding about

its role in affecting business-related outcomes such as knowledge-seeking effectiveness. However, contrary to original hypothesis, tie strength does not significantly predict knowledge acquisition. As several interviewees indicated that close networks sometimes are not considered a better choice for accessing entrepreneurial knowledge. In other words, the subjective feedback obtained from close social relationships might not lead to effective resource acquisition.

Another outcome of multiplex media use between entrepreneurs and mentors was relational multiplexity. Relational multiplexity refers to the resources given by mentor, which include career advice, social support, business skills, industry norms, network ties and investment. Having a greater number of multiplex relationships signals that early stage entrepreneurs are in a better position to leverage trust in the recruitment and organization of resources (Newbert & Tornikoski, 2012). The findings from this research demonstrate that a combination of media types could lead to access to more diverse resources, although it was noted in prior studies that people's total channel use remains constant so that media types compete with each other for resources (Newell, 2007),

Antecedents of media multiplexity. A set of demographic factors, social factors, and geographic factors were tested for their prediction power on media multiplexity. The findings indicate that entrepreneurs tend to use more media channels to engage with mentors when the age difference is smaller and when they have the same ethnic background. These results correspond with the trends that emerged in the interview data of establishing peer mentorship relationships among early-stage entrepreneurs and using community-based platforms for knowledge-seeking. Gender was not found to be significantly related to media multiplexity. The lack of significance for gender could be potentially explained by entrepreneurs' motivation to intentionally enlarge social circles by engaging with different gender mentors. Another

possibility is that more communication channels are needed between dyads of different gender due to less effective communication occurring on a single platform.

Benevolence-based trust between entrepreneur and mentor was found to be positively associated with media multiplexity. Indeed, Nahapiet and Ghoshal (1998) noted that there exists a "two-way interaction between trust and cooperation: trust lubricates cooperation, and cooperation itself breeds trust" (p.254). With higher levels of trust, entrepreneurs can be more comfortable establishing additional channels or switching channels for knowledge-seeking. As one founder mentioned in an interview, it is not the frequency of communication but both parties' perception of a flexible relationship that enhance the quality of their interactions.

Compared to benevolence-based trust, competence-based trust--which was conceptualized as the perceived value of mentor--was found to be negatively associated with media multiplexity. This finding means that if an entrepreneur perceives a mentor as highly valuable, he or she will employ fewer communication channels in approaching the mentor. This result runs counter to the conventional view in the intra-organizational context that higher perceived value of certain members makes individuals the target of advice seeking (Gibbons, 2004). However, using fewer media channels cannot be automatically interpreted as entrepreneurs' lacking motivation to seek knowledge or neglecting the value of mentor in offering knowledge. Entrepreneurs' engagement with well-connected mentors tends to be strategic with concerns about revealing negative information to them. When people connect on social media, they learn about each other's interests and values, as well as their engagement with people from diverse contexts in their lives, including family members and friends. Unlike face-to-face or phone communication, online media offers entrepreneurs less control in managing their tone and presentation to maintain a consistent and positive image. Therefore, entrepreneurs

might consolidate the use of media channels with mentors for managing impressions. Although the hypothesis was not supported, the findings point to an interesting topic for further investigation.

Theoretical Implications

The introduction to this dissertation summarized three main gaps in the literature on entrepreneurial knowledge and communication. First, the challenges of knowledge-seeking among entrepreneurs during early-stage entrepreneurial development have not been fully explained in prior research (Clough et al., 2018). Knowledge is considered to be a crucial resource for early stage entrepreneurs who have priorities in assembling teams, pivoting products and finding initial customers. Second, there is a need to explore how knowledge-seeking experience is differentiated by entrepreneurs' background and experience. While experience has been emphasized for its significance in opportunity identification and startup performance (Shane, 2000), there is insufficient understanding in prior literature with regards to the influences of prior experience on the process of knowledge-seeking. Third, there is growing interest in applying communication theories to studying entrepreneurial behavior in a resource-constraint environment (Shumate, Atouba, Cooper, & Pilny, 2014, Ulvenblad, Berggren, & Winborg, 2013). This dissertation responded to these three areas by taking a communicative perspective in examining three aspects of entrepreneurial knowledge transfer. The findings offer a number of implications for communication and entrepreneurship studies.

The identification of the factors influencing media use and the outcomes of media use among entrepreneurs during foundational stages is a primary contribution of this work. Although communication, taken as a general reference to the occurrence of information exchange, has been included in many prior studies on inter-organizational knowledge flow (Huggins & Johnston, 2010), an exploration of where such exchanges are happening, what contributes or

impedes such exchanges, and how entrepreneurs evaluate this exchange process offers insights for further theorization of knowledge transfer. One central concept examined in this dissertation is media multiplexity. Media multiplexity theory has received tremendous attention in the field of interpersonal networks on topics such as friendship. In addition, this theory has informed intra-organizational communication on the media repertoires employees adopt (Watson-Manheim & Belanger, 2007). However, this dissertation confirms that studying media multiplexity in inter-organizational settings is also important because it reaches beyond social relationships and work performance to really make an impact on resource acquisition. Second, the findings regarding the antecedents of media multiplexity suggest that demographic and social factors both influence the adoption of media in a dyadic relationship. These findings help to explain the motivations behind the use of multiple media in a resource-limited social context.

Furthermore, this research develops a two-dimensional conceptualization of early stage entrepreneurs' external communication as user-generated media use and knowledge network engagement. Previous work has studied entrepreneurs' interactions with specific knowledge sources, such as investors (Shepherd & Zacharakis, 2001) and customers (De Clercq & Rangarajan, 2008). However, knowledge-seeking is a continuous and spontaneous process underlying entrepreneurs' daily activities. The inclusion of a variety of user-generated media and knowledge networks helps capture the broader communicative efforts that entrepreneurs devote in knowledge-seeking.

This dissertation also makes several contributions to the study of entrepreneurial mentorship. The mentorship relationship was found to be more engaging and more effective compared to other knowledge-seeking relationships. However, this work also calls for further investigation of this boundary-blurred concept. For example, the knowledge-seeking behaviors

between entrepreneurs are usually considered as mentorship, but compared to traditional mentorship, the format is more interactive, more socially-oriented, and driven by the sharing of social context. The structurally similar positions of these early stage entrepreneurs create a conducive context in enabling resource sharing. This work helps advance the concept of mentorship in the inter-organizational setting.

The findings from this dissertation also answer some important questions about the characteristics and functions of knowledge in the process of organizational emergence. When previous work approach organizational knowledge, they focus mainly on the generation, sharing, storage and retrieval of knowledge. However, these four processes generally build on existing organizational structures, technology platforms, pre-determined social circles, etc. Although employees' different positions and functions influence knowledge-related processes, their broader contexts are aligned. This dissertation features an environment with single person representing the whole organization guided by limited organizational structures or norms. The findings about how entrepreneurs' role and responsibilities intervene their knowledge-seeking and their reliance on intermediaries to gain access to knowledge points out a direction for further understanding of knowledge transfer.

Methodologically, the mixed-method approach employed in this dissertation responds to recent calls for more first-hand data examining entrepreneurship processes and taking a communicative perspective. A recent study shows that the use of secondary data available online is a dominant method of studying entrepreneurial-related outcomes (Clough et al., 2018). However, this is subject to the survival bias since the startup companies who are in nascent or new business stages might not have documented data in publicly available database. The

combination of interview and survey data here provides a rich lens for understanding the motivations and strategies of knowledge-seeking actions.

Overall, knowledge-seeking was found to be more than an independent and one-way activity used for obtaining knowledge. Knowledge-seeking is a communicative pursuit for entrepreneurs to develop a broader understanding of the environment in which they are situated in and to make sense of their own contributions to the larger context. Entrepreneurs adapt to the external environment through the knowledge sharing and assimilating processes.

Practical Implications

In addition to the contributions to scholarship, the findings of this dissertation offer several practical implications for both entrepreneurs and a variety of entrepreneurship enablers. Firstly, the constraining effect of related prior experience on the perceived difficulty of knowledge access offers critical insights for founding team composition. Entrepreneurial teams were increasingly recognized as an advantage for resource acquisition and a proof of legitimacy for investors (Busenitz, Moesel, Fiet, & Barney, 1997). New organizations run by entrepreneurial teams generally possess a more diverse knowledge base and broader access to knowledge. However, it is important for entrepreneurs to take potential co-founders' prior experience into consideration when forming startup teams to enhance the effectiveness of knowledge acquisition. Similarly, the findings inform investors who usually use founders' experience as a signal for future performance. Deep prior experience in an established company in a similar field may not grant entrepreneurs the attitudes and behaviors conducive for knowledge access. The perceived difficulty in knowledge access can potentially lower entrepreneurs' self-efficacy and influence the whole entrepreneurial process. Therefore, investors are suggested to not overly rely on experience as the criteria for investment purpose.

Another practical insight is for policymakers and practitioners who are considering whether to allocate resources towards portfolio and serial entrepreneurs, as well as the provision of additional initiatives to increase the pool of novice entrepreneurs. The findings in this dissertation highlight the disadvantageous position of novice entrepreneurs in soliciting knowledge from stakeholders, especially for those student entrepreneurs with no industry experience, or entrepreneurs starting a new organization in an unfamiliar industry. However, venture capitalists tend to use entrepreneurs' experience to evaluate the potential of a new venture and decide resource offering (Riquelme & Rickards, 1992). More effort is needed from sponsorship programs to identify the knowledge needs of first-time entrepreneurs during foundational stages to increase their awareness of knowledge and better prepare them for resource acquisition.

Lastly, the significance of establishing mentor-mentee relationships on knowledge acquisition shown in this dissertation offers insights for entrepreneurs to rethink their approaches in building relationships and seeking knowledge. For example, when entrepreneurs form knowledge-seeking relationships with other peers, it is still important to articulate the nature of this relationship as mentorship, although the format is more mutually supportive. The sense of being a mentor conveys more meaning of responsibility and role modeling, which motivate the mentor to be more engaging in sharing knowledge.

Limitations

Despite the clear importance of the aforementioned findings, there are a number of limitations as well as potential for future research. Firstly, the statistical power of the quantitative study in this dissertation is limited due to the sample size. Although the data showed medium effect sizes independent of the population tested, and the characteristics of the sample were

highly aligned with the broader population in the NYC metropolitan area, it should not be assumed that this sample capture the full scale of the knowledge-intensive industries in general. In addition, the voices of only 20 respondents in the qualitative study do not represent all the possible variances in stories. Secondly, while multiple sampling methodologies were utilized for both survey and interview data collection, the sample used in this study might be somewhat skewed toward entrepreneurs who were more publicly visible. Entrepreneurs who have more complete online profile, who have participated in accelerator programs, or those who were more active in offline activities were more likely to be identified and contacted by the researcher. Entrepreneurs participate in certain online channels with different motivations and incentives, which raise the concerns of a potentially biased sampling frame (Horton & Tambe, 2015). A third shortcoming of the research design was the exclusion of input from other stakeholders in entrepreneurship ecosystem, such as investors or mentors. Although self-reported data from entrepreneurs could best describe their own knowledge-seeking experiences and the observational data can assist in understanding the context, it would have been useful to have knowledge sources' opinions to facilitate the interpretation of data.

Moreover, the quantitative dataset has an inherent limitation with regards to the reliance on self-reported data from entrepreneurs. Although this dissertation aims to fill the gap in research on the lack of measuring the way entrepreneurs engage in the knowledge-seeking process (Clough et al., 2018), it should be noted that there is variance in the subjective interpretation of survey questions. For example, for the measurement of knowledge explicitness, entrepreneurs with different educational backgrounds might interpret the question "was the information sufficiently explained to you in the text-based format (e.g. reports, emails, messages)?" differently. In addition, for the outcome variables such as knowledge access in

general and knowledge acquisition in dyadic relationship, entrepreneurs might evaluate their experiences differently based on personal characteristics and industry context.

Future Research

This dissertation points to several important areas for future research. One major development area is to use grounded theory to inductively generate codes from the interview data to identify themes and further develop communication theory in entrepreneurial context. While the induction analysis in this dissertation was driven by research questions, a grounded theory approach (Glaser & Strauss, 1967) is called for to create categories of early stage entrepreneurs' communication behaviors. Since entrepreneurial communication is a relatively new and interdisciplinary area of study, grounded theory avoids preconceived assumptions from each field and offers a more neutral view of understanding entrepreneurs' behaviors (Simmons, 2006). One potential research design is to first conduct case studies of early stage startups in accelerator programs in order to examine the way entrepreneurs search, communicate and construct knowledge during the program, and then to conduct additional interviews with mentors, peers, managers of the programs as well as with other entrepreneurs who are in the same field but not in the accelerator programs. Scholars would be able to observe real-time activities on site and to take in the whole process of the accelerator program; this would take 3 to 4 months in order to capture the full process, but would provide a rich breadth of data for analysis. The analysis would need to be based on detailed description of the way entrepreneurs react to ambiguous information or to a shortage of information and would also need to examine reactions comparatively to develop codes and themes. This research would help shed light on the role of communication in early stage resource mobilization.

Furthermore, communication scholars are encouraged to explore innovative ways to collaborate with policymakers and entrepreneurial sponsorship programs such as incubators. On the one hand, resource providers such as policymakers and incubators are knowledge brokers who occupy critical roles in filtering information and enhance the relevance of knowledge for entrepreneurs. Future scholarship could explore resource providers roles in helping construct knowledge in emerging industries and to understand their functions in removing institutional barriers that may exist between existing and emerging fields. Communication scholars could also conduct empirical studies to analyze entrepreneurs' behaviors in accelerator programs in order to provide practical insights to mitigate future failure rates, and to better understand processes of emergence. On the other hand, since many scholars challenge the idea that startup survival is always a positive outcome (Mejia & Gopal, 2015), it is also important for future research to examine how incubator programs accelerate the 'death' of a startup and how stakeholder networks (i.e. mentors and investors) in accelerator programs guide entrepreneurs to revise their startup ideas and facilitate the 'pivoting' process. More work is required to identify potential areas of tension arising from the interactions between entrepreneurs, stakeholders and incubators. For instance, an investigation into the typology of the message content of communication within the accelerator community would help assess the extent to which knowledge sharing activities occurred (e.g. the degree to which messages exchanged within the community serve to communicate actual knowledge pertaining to entrepreneurship as opposed to other types of content). This research is perhaps best done with content analysis and interviews. By focusing on these processes, scholars will be able to unpack both the positive and negative influences of incubator and accelerator type programs on organizational emergence.

Although this dissertation did not focus on the effect of founding teams on resource mobilization, future research should explore the relationship between internal knowledge sharing and external knowledge acquisition in greater depth, particularly how entrepreneurs' daily activities and responsibilities determine their knowledge needs. Future research should also probe deeper on how solo entrepreneur and entrepreneurial teams communicate knowledge needs differently. Identifying the function and utility of external communication networks in resource-limited or legitimacy-challenged organizations is another part of a much broader research agenda. An example would be improving our understanding of how organizations communicatively adapt to their institutional environment in the processes of organizational emergence. In addition, based on the understanding that experience influences behaviors, future research could further explore the processes and strategies selected by different types of entrepreneurs in pursuing knowledge. Novice and veteran entrepreneurs were found to have divergent characteristics and motivations in establishing new organizations (Westhead & Wright, 1999). Also, future research should emphasize the distinctions between technical knowledge and business knowledge, as well as the roles of these respective knowledge types in early stage organizational development. It would be useful for researchers to examine how early stage entrepreneurs prioritize the search of technical and business knowledge. Similarly, scholars should take the type of innovation into consideration when analyzing initial founding conditions. For example, whether exploration-oriented innovations and exploitation-based innovations demand different types of knowledge management strategies.

At the same time, research would benefit for scholarship that works to develop metrics and measures that can be used to capture and assess the knowledge-seeking processes and outcomes and associate them with startup performance. While some metrics, such as venture

capital investment, startup size, and failure rates are readily accessible, gathering data on the effectiveness of knowledge search processes and attempts to organize and access key resources is much more difficult. This dissertation measured the perceived effectiveness of knowledge seeking but more work is needed in providing insights into how "right" the entrepreneurs are in their perceptions of their entrepreneurial activities. Further understanding of the effectiveness of knowledge seeking would help shed light on its impact on other important outcomes. This type of research will help to develop a more nuanced understanding of entrepreneurship as a process of creating organization and will also enable more applicable policy recommendations at state and local levels to better develop entrepreneurship ecosystem.

More research is needed to better understand media use in entrepreneurial contexts. One future direction would be to explore how entrepreneurs engage with people with higher social status or power. The findings of this dissertation reveal that there might be potential explanation to better understanding media use in entrepreneurial context. Furthermore, this study focuses specifically on media use and knowledge network engagement as proxies for entrepreneur' external communication. Although media use measures covered a wide range of user-generated media channels, for example social networking sites, online communities, and news distribution websites, it would be helpful to further explore the emerging trends of online media use among entrepreneurs. As indicated by prior studies, the definition of media use is fragmented. Future research could differentiate whether entrepreneurs' involvement on those channels impacts their experiences in knowledge-seeking. For instance, entrepreneurs who produce content on social media might have different knowledge-seeking experiences than those who only respond to others' content or simply browse. In addition, the specific mechanisms that give rise to the benefit of using mix media are unable to be examined in detail here, but deserve attention in

future empirical investigations. The mix of media can be strategic, but overuse of media can be counter-productive (Doerfel & Haseki, 2015). Researchers should conduct more detailed analyses of the strategic media use that are more closely associated desirable entrepreneurial outcomes.

Finally, knowledge ambiguity and coping strategies could be examined in other new forms of organizing, such as shared economy businesses, on-demand work or human-computer interaction. Lastly, an extension of this dissertation is to consider the impact of knowledge-seeking on entrepreneurs' psychological well-being and entrepreneurial passion.

Concluding Thoughts

This dissertation introduces a communication perspective in understanding early stage entrepreneurs' knowledge-seeking behaviors during foundational stages. The research offers a more nuanced understanding of high-tech entrepreneurs' navigation of resources and a contextual knowledge about the startup environment in the NYC metropolitan area. Through the examination of media multiplexity in various contexts of knowledge-seeking, rich data has emerged to explain the underlying forces of communication in organizational emergence. In general, this dissertation offers implications for understanding the antecedents of and processes of knowledge transfer in entrepreneurship.

Appendix A-1

Summary of Intercorrelations, Means, and Standard Deviations for Variables (N=100)

Variables	*M*	*SD*	1	2	3	4	5	6	7	8
1. Breadth of experience	3.10	1.34	-							
2. Relatedness of experience	3.08	1.32	.24*	-						
3. Media use	1.69	1.58	.16	-.06	-					
4. Network engagement	1.88	1.53	.35**	.22*	.28**	-				
5. Knowledge access	3.30	.68	.16	.07	.26*	.15	-			
6. Knowledge explicitness	3.33	.61	.27**	1.6	.10	.24*	.55**	-		
7. Organizational size	1.33	.83	.07	-.10	-.02	.04	.03	.07	-	
8. Total capital raised	2.03	1.31	.24*	.02	.09	.13	.05	.03	.28**	-
9. Education	3.53	.81	.02	.20*	-.08	.09	-.01	.10	-.10	.09
10. Age	30.96	7.80	.27**	.31**	.03	-.05	.03	.07	.14	.14
11. [a] Gender	1.80	.40	.04	-.05	.09	-.14	-.09	-.05	.05	.11

Continued

Variables	*M*	*SD*	10	11	12
9. Education	3.53	.81	-		
10. Age	30.96	7.80	.05	-	
11. Gender	1.80	.40	-.01	-.08	-

Note. [a] Gender: 1= Female, 2= Male
*p< .05, **p<.01

Appendix A-2

Summary of Intercorrelations, Means, and Standard Deviations for Variables (N=80)

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Relational multiplexity	3.75	1.30	-								
2. Media multiplexity	3.61	1.48	.57**	-							
3. Knowledge acquisition	4.39	.61	.15	.07	-						
4. Tie strength	3.87	.80	.21	.33**	.47**	-					
5. Trust	4.20	.84	.16	.07	.40**	.31**	-				
6. Perceived value	4.32	.78	.03	-.16	.42**	.18	.72**	-			
7. Age similarity	1.47	.42	.00	.05	-.21	-.12	-.07	-.20	-		
8. Gender similarity	1.29	.47	.11	.15	.04	.16	.02	.03	.01	-	
9. Ethnicity similarity	1.51	.50	-.16	-.10	-.07	-.18	-.23*	-.17	-.05	.15	-
10. Proximity	1.60	.95	.06	.19	-.18	.50	-.13	-.14	.04	.04	-.08
11. Social embeddedness	2.01	1.04	-.08	-.06	-.10	.13	-.10	-.08	.05	-.14	-.16
12. Organizational size	1.28	.68	-.06	-.02	-.12	.01	-.05	.06	-.12	-.06	.00
13. Total capital raised	2.08	1.29	.08	.02	-.03	-.26*	.08	.05	-.13	-.21	-.06
14. Education	3.56	.84	-.07	.02	-.15	-.00	-.09	-.06	-.04	.17	.17
15. Age	30.64	7.76	-.16	-.19	.16	.10	.23*	.26*	-.56**	.02	-.16
16. [a] Gender	1.78	.42	-.12	-.21	-.18	-.18	-.22*	-.14	0.4	-.65**	.00

Standardized beta coefficients are reported

Continued

Variables	*M*	*SD*	10	11	12	13	14	15	16
10. Proximity	1.60	.95	-						
11. Social embeddedness	2.01	1.04	.18	-					
12. Organizational size	1.28	.68	.25*	.03	-				
13. Total capital raised	2.08	1.29	.34	-.15	.15	-			
14. Education	3.56	.84	.02	-.02	-.12	.10	-		
15. Age	30.64	7.76	-.02	-.10	.03	.14	.10	-	
16. [a] Gender	1.78	.42	-.09	.13	-.00	.10	.00	-.15	-

Note. [a] Gender: 1= Female, 2= Male
*p< .05, **p<.01

Appendix A-3

Summary of Intercorrelations, Means, and Standard Deviations for Variables (N=80)

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Media multiplexity	3.59	1.47	-								
2. Age dissimilarity	1.48	.42	.04	-							
3. Gender dissimilarity	1.28	.45	.14	.04	-						
4. Ethnicity dissimilarity	1.47	.50	-.17	-.03	.13	-					
5. Proximity	1.59	.93	.22*	.03	.02	-.10	-				
6. Trust	4.22	.85	.11	-.07	.03	-.22*	-.16	-			
7. Perceived value	4.33	.78	-.15	-.19	.02	-.18	-.11	.73**	-		
8. Social embeddedness	.27	.21	.11	.03	-.12	.12	.10	.03	-.05	-	
9. Organizational size	1.27	.68	.00	-.10	-.07	-.13	.81**	-.05	.03	.03	-
10. Total capital raised	2.07	1.31	.03	-.12	-.22*	-.07	.03	.06	.05	-.12	.16
11. Education	3.57	.83	-.00	-.05	.22	.19*	-.00	-.13	-.05	-.03	-.08
12. Age	30.59	7.97	-.19	-.56**	.03	-.18	-.00	.22*	.25*	-.08	.02
13. [a] Gender	1.77	.42	-.24*	.00	-.66	-.00	-.10	-.22*	-.12	.11	.03

Continued

Variables	*M*	*SD*	10	11	12	13
13. Total capital raised	2.07	1.31	-			
14. Education	3.57	.83	.06	-		
15. Age	30.59	7.97	.14	.10	-	
16. [a] Gender	1.77	.42	.13	-.01	-.15	-

Note. [a] Gender: 1= Female, 2= Male
*p< .05, **p< .01

Appendix B

Terminology

Breadth of prior experience: the range of an entrepreneur's past work experience across different industries, organizations, and functional areas.

Early stage entrepreneur: the owners of organizations in the nascent or new business stages

Entrepreneurial knowledge: the knowledge of where to obtain resource and of how to deploy it, which covers knowledge about market conditions, hiring and partnership, management practices, finance, R&D and technology, and career development.

Entrepreneurial mentorship: the development-oriented interpersonal relationship that support early stage entrepreneurs

External communication: the channels and sources that an entrepreneur relies on in obtaining knowledge

Knowledge-intensive organization: organizations either product technology as an end product or use technology in the production process

Knowledge ambiguity: the inherent and irreducible uncertainty as to what the underlying knowledge components and sources are and how they interact

Knowledge explicitness: the degree that entrepreneurial knowledge can be easily documented and expressed in writing.

Knowledge network engagement: the frequency of network engagement for knowledge-seeking.

Knowledge access: the perceived easiness of knowledge access across six entrepreneurial knowledge types

Knowledge acquisition: the perceived effectiveness of knowledge acquisition when interacting with mentors.

Media use: the frequency of media use for knowledge-seeking either with or without the presence of a specific knowledge source.

Media multiplexity: the number of media channels used for communication between entrepreneur and mentor

Nascent business stage: the period when potential entrepreneurs begin setting up a business, which includes idea conception phase and pre-startup phase.

New business stage: the survival and early growth phases after product launch, which usually last about 3.5 years

Relatedness of prior experience: the similarity between an entrepreneur's past work experience and current new venture in the knowledge of industry, markets and solutions.

Relational multiplexity: the number of resources entrepreneur gain from mentor

Social embeddedness: the total number of overlapping social circles between entrepreneurs and their mentors.

Tie strength: the perceived closeness between entrepreneurs and their mentors.

Appendix C

Interview Consent Form

You are invited to participate in a research study that is being conducted by Wei Shi, who is a PhD candidate in the School of Communication and Information at Rutgers University. The purpose of this research is to examine early stage entrepreneurs' communication patterns, their relationships with mentors and the effect of media choice on knowledge acquisition.

Approximately 20 subjects will participate in the study, and each individual's participation will last approximately 30 minutes.

The study procedures include a brief research introduction, some general questions about your business, and more specific questions about your interactions with mentors.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. Some of the information collected about you includes your company, your product, and your social relationships. Please note that we will keep this information confidential by limiting individual's access to the research data and keeping it in a secure location. We will use password protected computer and put the recordings in a locked file cabinet and linked with a code to subjects' identity.

The research team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be destroyed upon publication of study results.

There are no foreseeable risks to participation in this study.

You have been told that the benefits of taking part in this study may be: winning $50 compensation. However, you may receive no direct benefit from taking part in this study. You will receive $50 Amazon Gift Card for completing the entire study.

Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the study procedures without any penalty to you. In addition, you may choose not to answer any questions with which you are not comfortable.

If you have any questions about the study or study procedures, you may contact myself at Wei Shi, ws307@scarletmail.rutgers.edu, 732-986-3346. You may also contact my faculty advisor Matthew Weber, matthew.weber@rutgers.edu, 848-932-8718.

If you have any questions about your rights as a research subject, please contact an IRB Administrator at the Rutgers University, Arts and Sciences IRB:

Institutional Review Board
Rutgers University, the State University of New Jersey

Liberty Plaza / Suite 3200
335 George Street, 3rd Floor
New Brunswick, NJ 08901
Phone: 732-235-2866
Email: humansubjects@orsp.rutgers.edu

You will be given a copy of this consent form for your records.
Sign below if you agree to participate in this research study:

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Audio/Visual Addendum to Consent Form

You have already agreed to participate in a research study entitled: Multiplex Networks and Early stage entrepreneurs' Quest for Knowledge conducted by Wei Shi. We are asking for your permission to allow us to include audiotape part of that research study. You do not have to agree to be recorded in order to participate in the main part of the study.

The recording(s) will be used for analysis by the research team.

The recording(s) will include the subjects name and all the identifiable information will be kept confidential. If you say anything that you believe at a later point may be hurtful and/or damage your reputation, then you can ask the interviewer to rewind the recording and record over such information OR you can ask that certain text be removed from the dataset/transcripts.

The recording(s) will be stored in a locked file cabinet and linked with a code to subjects' identity. The recordings will be destroyed upon publication of study results.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Appendix D

Survey Consent Form

Purpose: Researchers at Rutgers University are conducting a study to explore the effect of media use on knowledge acquisition among early stage entrepreneurs. You will be asked to complete a survey, which will take 5-10 minutes to complete. You will be one of approximately 200 subjects. Participation in this study is voluntary.

Risks: No risks are anticipated from taking part in this study. If you feel any discomfort from responding to the questions, you may close out of the browser at any time.

Confidentiality: Your responses will be kept completely confidential. All results will be reported in aggregate and there will be no way to link your individual response with anything reported. The principal investigator has put in place adequate protections for your privacy by using a randomly generated number code in place of your email address. Once data collection is finished, your e-mail address will be shredded and no link between the survey data and identity will exist. The code will be kept securely by the research team only until the publication of results in 2019. After the publishing of research results, the data will be destroyed.

Benefits: There are no direct benefits to you but there are benefits to the society as your response will help advance the knowledge in communication and entrepreneurship. By completing the survey questions, you will be given a choice to enter the raffle of winning a $100 Amazon Gift Card. To enter, you will need to enter your email address at the end of the survey. This information **will not** be associated with your responses in any way. Your contact information will be used solely for the drawing and nothing else. Winners will be drawn in October 2018 and notified by November of 2018.

How the findings will be used: The results from the study will be presented at academic conferences and the results may be published in associated journals.

Contact information: If you have concerns or questions about this research study, please contact the principal investigator Wei Shi at ws307@rutgers.edu, (732)-986-3346. You may also contact the faculty advisor Matthew Weber at msw@umn.edu, (848)-932-8718. If you have questions about your rights as a research subject, please contact the IRB Director at (732)-235-2866, human-subjects@ored.rutgers.edu.

By beginning the survey, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty.

Appendix E

Recruitment Message

RUTGERS
UNIVERSITY

Department of Communication
School of Communication and Information
Rutgers University

Hello!

You're invited to participate in our online survey about your experiences as an entrepreneur!

This study explores media use and the way you obtain new knowledge in day-to-day work, which have been shown to affect startup performance. Your responses will help us understand the impact of communication on entrepreneurial experience and outcomes.

This survey will take you about 5-10 minutes. Your responses in this survey will be kept strictly confidential. By completing the survey, participants will be given the choice to enter a drawing for a $100 Amazon Gift Card.

To be part of this study you should be:

- Currently running a startup or planning a startup
- In a technology-related or business service industry
- Located in the Greater New York City area

To participate, simply click on this link: http://earlystartupsurvey

For further information, please contact the researcher Wei Shi (ws307@rutgers.edu).

Thank you so much! Your participation is incredibly helpful!

Best,

Wei Shi

PhD Candidate
Department of Communication
Rutgers University
Tel: (732)986-3346
ws307@rutgers.edu

Appendix F

Interview Protocol

INTRODUCTION

(Introduce myself. Shake hands with interviewee.)

"Thank you for taking time out of your busy schedule to meet with me today. As I explained in the Email, I am interested in learning about your knowledge seeking patterns, your media use to relationship building and specifically your experience engaging with mentors. This interview will take about 30-45 minutes and your participation is voluntary. Any information you give will be kept strictly confidential."

"Before we begin the interview, I am required to obtain your written consent to participate in this study as well as your consent to audio-record the interview for research purposes. Please read carefully the informed consent document and feel free to ask any questions or discuss any concerns you may have before you sign it.

[Note that the consent document can be provided ahead of time, in which case the language would be "You received the informed consent via email; please feel free to ask any questions or discuss any concerns you may have before you sign it.]

I will leave with you a copy of this document so you may use it as a reference regarding your rights as a research subject and whom you may contact following the interview with any questions or concerns."

> ***If interviewee provides consent***: *proceed with script*.
> ***If interviewee declines to consent***: *End interview by saying* "Thank you for your time and have a nice day. Goodbye"

"Thank you. I will start by asking you a few questions about your business, continue with more specific questions about your interactions with external environments and finish by asking about what you recommend researchers do to promote the development of a supportive entrepreneurial ecosystem."

"Do you have any questions before we continue?"

INTERVIEW QUESTIONS

1. Please tell me about the status of your startup.

?? Probe about how he/she came up with the idea originally. What opportunity contributes to his/her startup business?

?? Who are the team members? What' the future plan?

2. Tell me about a time when you were unsure about how to proceed with your business. How did you deal with those uncertain moments? What information or advice you wish you had at that time?

?? Probe about what was the experience like. What kind of uncertain situation?

?? What did they do to seek help? What channels did they use?

3. What kind of information or insights are useful for your company in general throughout your startup process?

?? What are the main sources of knowledge for you? Who are the people you usually talk to?

?? How do you access those insights? Any online resources or offline activities are helpful?

?? Why do you use certain channels? And how easy was it to get the information you want?

3. We know that prior experience may influences how you behave in your next venture. Reflecting upon your previous experience, can you tell me in founding this new business, how much could you leverage your previous resources (e.g. connections, reputations)? What are the new challenges?

??Have your previous experiences affected your ability to establish business relationships and acquire new business knowledge? If so, how?

?? For the new challenges, how do you seek help? Ask for specific examples.

4. Do you have someone you always to go to for advice?

?? Do you consider this person as your mentor? If says yes, probe about the motivations that he/she connect with those mentors.

?? Ask about the channels that support their connections-e.g. social events, online networking,

?? How do you develop your relationship with this mentor? How have your communication behaviors changed since your initial connection with the mentors?

?? If says no: Ask similar questions about his or her engagement with a typical knowledge source.

5. Think about a mentor that you frequently communicated with. Can you tell me about more about how you engaged with him/her. How did you two meet? How did he/she help you?

?? What's the background of this mentor (e.g. expertise, organization affiliation)?

?? Probe about specific types of information or knowledge (e.g. concepts, competitor behaviors, market trends) he/she seek from the mentor. How openly do you discuss things?

?? What communication channels (e.g. mediated, face-to-face) do you use for engagement and why? How does your knowledge seeking vary based on different medial used?

6. Tell me about your experience using different communication channels (e.g. face-to-face, phone call, social media, etc.) when you are engaging with your mentor or advisor.

?? For example, in what condition do you send them email or text message?

?? What are the purposes associating with each media you use? Which media channels do you prefer and why?

7. What are the opportunities and challenges of connecting with mentors or finding knowledge in your industry or in the New York City area?

?? Probe about the advantages and disadvantages of founding a business in Greater New York area.

?? What kinds of opportunities do they expect and how would they leverage them?

8. Before we conclude this interview, is there anything about your startup experience that you think influences your access to knowledge?

[If appropriate, ask for permission to follow up later with a short phone call to verify or clarify the information provided in the course of the interview. Also ask for copies or URLs of documents mentioned by the interviewee. Be sure to leave a copy of the consent form]

"Thank you for participating in this interview today. In appreciation of your time, we have a $25 Amazon.com gift certificate for you. I will email it to you today."

[Hand the gift certificate to interviewee and shake hands.]

"Have a nice day."

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