

The Role of Entrepreneurial Networks in the Creation of New Technology-Based Firms in Colombia

Key words:

New Technology-Based Firms (NTBF), Entrepreneurial Networks, Knowledge-Based View, Commercialization of technology.

ABSTRACT

Entrepreneurial networks are recognized as the most important source of resources for new technology-based firms creation. Efficient networks not only facilitates the transfer of knowledge but also provide the entrepreneur with relevant information about where to find resources. In the case of emerging markets, however, entrepreneurial networks are often in their early-stages, and although there may be a number of institutions supporting and promoting entrepreneurship, ties between institutions may not be yet efficient to transfer knowledge. This paper presents an analysis of a developing entrepreneurial network, using Colombia as a case, in order to assess the state of its several dimensions. Several levels of the entrepreneurial network were clarified with their strengths and weaknesses. Findings suggest that, although National and Regional policies are encouraging entrepreneurship, Entrepreneurial Networks in Colombia are still searching and exploring effective paths to promote new technology-based firm creation.

RESUMEN

Las redes de emprendimiento son la fuente más importante de recursos en la creación de empresas de base tecnológica. En redes de emprendimiento eficientes se facilita la transferencia de conocimiento al tiempo que se ofrece información relevante al emprendedor acerca de donde puede encontrar los recursos que necesita. Sin embargo, las redes de emprendimiento en Colombia están en etapas iniciales de creación, y aunque hay una gran variedad y cantidad de instituciones soportando y promoviendo la creación de empresas, estas redes aún no son consideradas eficientes. Este artículo presenta un análisis de una red de emprendimiento en desarrollo, usando Colombia como caso de estudio, con el fin de evaluar el estado de las diferentes dimensiones de esta red (estructural, gobernanza y cognitivo). Se identificaron diversos niveles en la red de emprendimiento, sus fortalezas y aspectos por mejorar. Los resultados sugieren que las diversas redes de emprendimiento, nacional y regionales, aun están buscando y explorando rutas efectivas para promover la creación de empresas de base tecnológica.

1. Introduction

Successful entrepreneurs recognise the importance of networks in the process of starting a new firm (Bessant and Tidd, 2007). To enable the growth and survival of new ventures, research demonstrates that social capital can be acquired through efficient networks in which the system helps the entrepreneur to gather the information and advice needed, independently of the time of entrepreneur network entrance (Birley, 1985). This paper aims to describe the role of

entrepreneurial networks in enhancing the creation of NTBF in a developing country like Colombia, where the economy has been improving in the past years and entrepreneurial networks are in early stages.

The creation of the entrepreneurial law (Law 1014 of 2006) in Colombia, has opened a legal background for the promotion of entrepreneurship, this framework has promoted and encouraged the creation of several institutions in the country. Although the Ministry of Commerce, Industry and Tourism recognized 730 institutions promoting entrepreneurship in Colombia, a study from EAN (a Colombia university) found that there are 832 institutions promoting entrepreneurship in Colombia (Table 1).

This paper is developed in three sections, the first one explain the importance of networks in NTBF creation, the second section describes entrepreneurial networks in Colombia and its main cities, and the third one present the role of Colombian Entrepreneurial Networks in NTBF creation.

Table 1. Number of institutions promoting entrepreneurship in Colombia.

Region	N. Instit.
Centre (includes Bogota, Bucaramanga)	152
Choco, Eje Cafetero (includes Medellin, Manizales)	222
South-west (Includes Cali)	180
Caribbean (Includes Barranquilla)	215
East	63
Total	832

2. Importance of Networks in NTBF

Rickne and Jacobsson (1996) define new technology-based firms (NTBF) as new firms developing and serving knowledge and technology intensive products or services. (Aaboen et al., 2006) refers to certain criteria of size, year of foundation, independence at start, and industry (industries covered include: Software/information technology; Technology consultants; Electronics/electrical; Pharmacology; Pharmaceutical preparation; Mechanics; Chemical; Plastics). Much emphasis is placed on technology industries; therefore a workable definition seems essential. Nevertheless, the term "new technology-based firm" has not been clearly defined yet. Adopted for the purpose of this research, is the definition given by Rickne and Jacobsson, because its main interest is to contribute to a better understanding of the influence of entrepreneurial networks as the main source of knowledge in NTBF creation, in a BIRC country as Colombia.

Commercialization of new technologies has been covered by several authors (George and Block, 2009, Dorf and Byers, 2008, Lang, 2002). Regardless whether there is a gap in the market, or whether there is a need for creating a new market, the commercialization process of a new technology has been compared with a "Valley of Death" (Barr et al., 2009).

Technology- based business literature identifies commercialization as a critical state of start-ups, and presents lack of market knowledge as one of the causes of the Valley of Death because the slower the exploitation of market knowledge, the slower the invention to become a marketable product. The later the product enters the market, the harder it is to compete because the likelihood of more rivals is bigger. A question follows: how can entrepreneurs acquire market knowledge?

Some papers present the importance of prior knowledge and of a large knowledge base for the development of new knowledge of the firm (Aaboen et al., 2006; Dencker et al., 2009). Prior knowledge within the entrepreneurial team has been identified as a success factor in NTBF performance because the broader the knowledge base of the team, the easier to understand what new knowledge is needed and useful for the development of the new technology. Therefore, a large knowledge base impacts positively on the acquisition of new knowledge. However, although the literature states the importance of knowledge in creating technology based start-ups (Audretsch and Keilbach, 2008; Shane, 2005; Vendrell-Herrero et al., 2011), acquisition of knowledge and in particularly acquisition of market knowledge, remains an issue to better understand.

Huber (1991) presented a typology of processes used by organizations to acquire information or knowledge: (1) congenital learning, congenital knowledge is acquired while creating the firm and includes prior knowledge, (2) experiential learning, experiential knowledge is acquired by direct experience and most times is unintentional and unsystematic, (3) vicarious learning, knowledge acquired second hand, learning from other firms, (4) grafting a new member, (5) searching through scanning, focused search and performance monitoring. Efficient entrepreneurial networks are the main source of knowledge for NTBF. Entrepreneurs mainly learn by doing, they use strategic networks when they are creating the firm and developing the new product, they seek for information and knowledge that can be useful to achieve performance. Entrepreneurs use their contacts to acquire knowledge or information. The Knowledge Based View (KBV), as an extension of Resource-based Theory (RBT) (Grant, 1996), suggests that new firms execute several processes to acquire, distribute, integrate and use the knowledge required to perform. Networks are the main source of resources (knowledge) for creating a technology-based firm.

Spender (1996) states that “it is the firm’s knowledge, and its ability to generate knowledge, that lies at the core of a more epistemologically sound theory of the firm”. Grant (1996) developed some key elements toward a knowledge-based theory of the firm, with knowledge as the most strategic resource. Several authors assert that knowledge represents the most important and critical resource in start-ups (Autio et al., 2000; West and Noel, 2009; Brush et al., 2001; Nonaka et al., 2000; Lockett and Wright, 2005). “Knowledge is particularly important for technology-based firms: generating and exploiting knowledge in high-technology sectors demands that knowledge be continually replenished. Because the acquisition and exploitation of knowledge are predominantly social processes, social capital may be critical for the long term success of technology-based firms” (Yi-Renko et al, 2000:5) and an entrepreneurs’ social capital is determined by the quality of its networks. Network relationships are a source of capital and of intangible resources.

3. Network Dimensions

“Networks can be defined as a specific set of ties between a defined set of actors with the characteristic that the linkages as a whole may be used to interpret the social behaviour of the

actors involved” (Lechner et al., 2006: 516). Network research distinguishes three elements to explain the role of networks in firm performance: network content, network governance and network structure (Hoang and Antoncic, 2003).

3.1 Content Dimension

This dimension refers to the content of the information offered by the network. Entrepreneurs develop networks that offer different types of knowledge or expertise (Collinson and Gregson, 2003): strategic (for matching technological and market opportunities), managerial (for human-resourcing, organization/firm creation and financing) and technical (for product development).

Relationships can have reputational and signalling content because entrepreneurs seek for information to measure the potential of their ideas. Legitimacy helps reduce uncertainty because uncertainty is reduced by having certification from experts or from recognized organizations (Hoang and Antoncic, 2003).

3.2 Governance Dimension

The relational dimension of social capital and governance, represents the personal relationships people have developed with each other through interactions. Governance is defined by reliance on “implicit and open-ended contracts” supported by power and influence, or by trust as the critical mechanism that enhances the quality of the resources (Hoang and Antoncic, 2003). Governance mechanisms are critical for creating cost advantages, and trust in networks is vital for allowing resources to flow through actors and get the most advantage.

Trust among the actors of the networks allows information to flow, as people are more likely to share information and knowledge with people they trust. Entrepreneurs acquire knowledge from sources they identify as reliable. This is one of the criteria to consider information as legitimate.

3.3 Structural dimension

Structural dimension corresponds to the dynamics of network social structures. (Aldrich and Zimmer, 1986) studied the role of structures within entrepreneurial networks. They affirm that linkages between potential entrepreneurs, resources and opportunities can promote or limit entrepreneurship.

As presented in chapter 2, Wilken (1979) identified three *stages* in the process of creating a business; 1) the motivation phase - idea development, 2) the planning stage-organizing the knowledge and finance resources required, and 3) the establishment phase-running the newly established firm.

Greve and Salaf (2003) and Greeve (1995) studied the network activities of entrepreneurs during the different stages of the entrepreneurship in four different developed countries (United States, Italy, Norway and Sweden). They found that time spent by entrepreneurs on developing ties increases along the entrepreneurial process, meaning that time spent on

developing the idea during the development stage is less than the time spent on the establishment stage.

Entrepreneurs spend more time maintaining ties and organizing the foundations of the firm than developing the idea. Further findings indicate that density does not change significantly between the stages of new venture creation. However, a slight increase was found in the planning stage. In general, contacts in the network are tightly connected, therefore higher densities in networks, where previous relationships exist, may generate high tendency for information redundancy.

Furthermore, Aldrich and Martinez (2011) studied how cohesion and diversity, as strategies for entrepreneurs, have influenced on entrepreneurial outcomes (survival, profitability, innovation and efficiency), in addition to entrepreneurial strategies for developing cohesion and diversity at the different stages of the entrepreneurial process.

Martinez and Aldrich (2011) studied cohesion and diversity and found that while strong social relations among members (cohesion) decreases along the entrepreneurial process, substantial variation in social characteristics among members (diversity) increases. Networks are mostly informal and family represents a significant source of confidence at the beginning of the entrepreneurial process. Formal networks are needed to get more specialized resources when the entrepreneurship moves to the following stages. Table 2 summarizes the variables studied by Greeve, Salaf, Aldrich and Martinez.

Table 2. Ties and Configuration of the Network within the Entrepreneurial Process

	<i>1. Idea development</i>	<i>2. Organizing the founding team</i>	<i>3. Running a newly established firm</i>
Time developing ties	Low	Medium	High
Time maintaining ties	Low	High	Medium
Density	Medium	Low	Medium
Cohesion	High	Medium	Low
Diversity	Low	Medium	High

Source: Own elaboration, summary of the references cited previously.

4. Networks as a Source of Capital

Resources providing shared representations, interpretations, and systems of meaning among parties, represent the cognitive dimension of social capital. The importance of networks relies in the cognitive social capital (Nahapiet and Ghoshal, 1998; Inkpen and Tsang, 2005), resources that provide shared representations, interpretations, and systems of meaning among parties. The acquisition and transformation of social capital generates important direct outcomes such as opportunities to discover, secure resources, gain legitimacy and achieve higher growth rates. Indirect outcomes are also achieved such as the acquisition of

intellectual, human and financial capital (access to resources such as venture capital, references in contests, and low prices in resources).

Yli-Renko et al (2000) identified the importance of social capital in inter-organizational strategy. They measured social interaction, relationship quality and customer network ties. People, through relationships, can acquire knowledge, skills and capabilities to act differently (develop human capital) and increase intellectual capital (Nahapiet and Ghoshal, 1998). Combination and exchange of knowledge are complex social processes. Valuable knowledge is fundamentally socially embedded in particular situations, coactivity and in relationships.

6. Method

This research uses a **cross-sectional design** to identify the different networks coexisting in Colombia (content, structure and governance dimension). An inductive approach was used to describe the stage of the ecosystems in Colombia and its four main cities (Bogota, Medellin, Cali and Barranquilla), aiming to draw generalizations about the efficiency of the entrepreneurial (eco)systems in Colombia and in those cities.

Interviews were conducted with experts and practitioners in entrepreneurship, and with entrepreneurs in Colombia since June 2011. A snowball sampling was used to identify the key actors in each city. A total of 53 people were contacted in the snowball sampling: 21 meetings (with non-structured interviews) and 32 semi-structured interviews. Meetings allowed the researcher to identify key actors to interview and they helped to contact interviewees. Interviewees belong to several types of institutions: government, universities, new firms, and support institutions such as incubators and chambers of commerce. Since the main interest is NTBF creation, actors related to NTBF creation compose the sample (see table below).

Table 3. Sample of experts per city and type of institution¹.

	<i>Bogota</i>	<i>Medellin</i>	<i>Cali</i>	<i>Barranquilla</i>	<i>TOTAL</i>
<i>Governam. Inst.</i>	7	1			8
<i>Universities</i>	2	3	1	1	7
<i>Support Inst.</i>	3	9	1	1	14

Compared to Medellin and Bogota, information saturation was reached with less interviewees in Barranquilla and Cali, thus the number of people contacted in these two cities was lower. Regarding the National Entrepreneurial Network, Law 1014 establishes that 15 institutions form the National Entrepreneurial Network, all these institutions are based in Bogota, and therefore the National Network supports entrepreneurial activity in Bogota.

NVivo was used to codify the interviews and Grounded-Theory for determining the efficiency of the networks and for examining the role of entrepreneurial networks in NTBF creation in Colombia (Suddaby, 2006).

¹ Interviewees were also asked about their perceptions of the other cities' entrepreneurial networks. Once saturation was reached, the process of interviewing was stopped.

7. Findings

Entrepreneurial Networks in Colombia

There are over 700 institutions promoting entrepreneurship in Colombia. 832 institutions were identified by the EAN report in 2011, while The National Department of Planning identified 730 institutions supporting entrepreneurship in 2012. It was identified that 80% of these institutions promoting entrepreneurship belong to regional entrepreneurship networks.

The National Entrepreneurial Network is chaired by the Ministry of Industry, Commerce and Tourism. The National System of Entrepreneurship has passed through three stages²: the first one was between 2004 and 2006, during which three important mechanisms were created: The Entrepreneurial Law³, “Fondo Emprender”⁴ and the National Policy of Entrepreneurship⁵. The creation of these mechanism is important, because all types of institutions were encouraged to promote entrepreneurship, including: schools, universities, technical institutes, SMEs, large firms, local governments and institutions aimed at promoting competitiveness in the several regions of the country.

The second stage is characterized by the creation of entrepreneurial programmes in all the regions, start-up entrepreneurship become a regular conversation topic. The Entrepreneurial Law and The National Policy of Entrepreneurship created a need to promote entrepreneurship in several levels of the productive and educational systems. New institutions, such as incubators, were created in order to accomplish the aims of policies. However, these institutions emerge independently and without following any pattern or guidelines. As a result, institutions were not articulated within them.

The third stage corresponds to the current moment when actors are aware of the importance of working together, and are identifying their strengths and challenges. The following section describes the dimensions and stage of the National and four Regional Entrepreneurial Networks in Colombia.

Structure, Content and Governance of the National Entrepreneurial Network

All the interviewees ascertained that there are many institutions in Colombian promoting entrepreneurship but they also affirmed that this network is not efficient yet: “*with many actors, obliged and guests, but I think without articulation, without integration*”. Regarding the structure of the National Entrepreneurial Network, four categories describe the role of the several actors that form the National Network:

²Sergio Zuluaga, Innovation and Entrepreneurship Director at the Ministry of Industry, Commerce and Tourism.

³Created in 2004, to to encourage an Entrepreneurial Culture in Colombia.

⁴Created in Law 789 2002, the aim is to finance star-ups created by people with technical or professional education level.

⁵<https://www.mincomercio.gov.co/minindustria/publicaciones.php?id=16435>

- 1). The Government developing policies and support tools such as contests for choosing and encouraging the best initiatives. Six key actors were identified as promoting NTBF creation in this category: Colciencias (C&T National Department), SENA, Innpulsa, Ministry of Culture, Ministry of ICT, and Ministry of Commerce, Industry and Tourism
- 2). Universities, the second category, are key actors because entrepreneurs and their teams gain human capital when they participate in educational programmes, both in formal and in informal education. Several interviewees affirmed that universities develop their own entrepreneurial programmes within entrepreneurial offices but they are not working with the other actors of the network.
- 3). Support institutions such as incubators, accelerators, and entrepreneurial units among others. These institutions were part of regional entrepreneurial networks, and their role in the value chain varies from focalized aims like providing financial capital to transversal roles aimed at supporting all stages in the value chain.
- 4). Finally, there are private institutions that support entrepreneurship although, this may not be their main mission. Some of them were promoted by the National Government to encourage entrepreneurship, such as: “Cajas de compensación familiar⁶”, but others, like the chambers of commerce, have identified entrepreneurs as potential key customers, and therefore this institutions have assumed a key role like in Bogota and in Barranquilla.

The actors of the National Entrepreneurial Network are working together to define how institutions are going to focus their efforts into specific contents. They are meeting in order to clarify how they are going to promote entrepreneurship, and they defined four types of entrepreneurs to encourage: *“We have had to find general agreements like please let’s agree about the different paths to approach these four types of entrepreneurship”*. They decided to categorize entrepreneurship using the GEM categorization: Necessity-driven and opportunity-driven entrepreneurship, - each of which is classified in two groups; necessity-driven entrepreneurship for subsistence and traditional, and opportunity-driven which can be dynamic and High Impact Entrepreneurship (HIE)-. The main difference between these two types of entrepreneurship is the level of sales: over COP \$6,000 millions for HIE and higher than COP \$ 400 millions if the business is less than 3 years old.

Government institutions are developing building conditions for working together in focalized types of entrepreneurs, but building trust is a challenge because trust is based on people and government staffs change often. Although Government institutions need to have a defined and strategic role in the System, while the entrepreneurial networks evolve and achieve a more mature stage, their roles will also evolve. Regardless of the stage of the networks, the main role of the National Entrepreneurial Network is to lead the Entrepreneurial Ecosystem: *“The National Entrepreneurial System exists, but it is in charge of developing conditions to support and enhance all the ecosystem...”*; by guaranteeing basic conditions all types of entrepreneurship will be encouraged.

⁶“Caja de compensación familiar” is a non-profit organization that offers services of education, health and fun to employees; employers have to pay a percentage of these services.

Regional Entrepreneurial Networks

Bogota, Capital of Colombia

Several actors of the Entrepreneurial Network in Bogota also participate in the National Entrepreneurial Network, because all government and national institutions are based in Bogota. The Chamber of Commerce of Bogota has assumed a leadership in the city. The local government has been supporting entrepreneurship since 2006. The mayor of Bogota and the Chamber of Commerce have invested a total US\$ 8 million in promoting entrepreneurship, no other local government in the country has invested such amount of resources.

All types of institutions are connected through the alliance University-Industry-Government (Connect Bogota), but the regional network is not efficient yet: *“It has many institutions working for entrepreneurship, but articulation is not good enough... the strength of this network is that the level of intervention is becoming strategically organized by type of entrepreneurship”*.

The actors of the entrepreneurial networks in Bogota are focusing their roles and efforts in the same types defined by the National System. Regarding the content of networks, Bogota has the best indicator of High Impact Entrepreneurship: 67% of Colombia's HIE generated in Bogota (only 15% of HIE were created in Medellin). This implies that the efforts of Bogota's Networks are more alienated to this type of entrepreneurship. Bogota is the origin of the knowledge transfer related to entrepreneurial promotion practices to some of the institutions in Barranquilla and Cali.

Medellin

Medellin entrepreneurial ecosystem has been supported by the local government since 2004, therefore there are many institutions promoting entrepreneurship while competing for financial resources. Medellin has established and strong institutions working toward competitiveness, because the University-Industry-Government relationship has been a key point in the economic and social development of the region since 1980.

Although there are some big institutions that developing their own programs with autonomy (Parque E, Creame, Centres of Technological Development), actors are conscious of the importance of working together and they are focusing in specific stages of the value chain, recognizing their strengths and articulating their roles: *“they all (the actors) sit together and some of them redefine their target markets and/or programs, in order to assume strategic roles and to identify empty spaces to fill in the value chain”*. This is a step to building stronger links between the institutions; stronger links will help to develop governance in the networks.

Regarding content, three levels of entrepreneurship can be identified: (1) necessity-driven entrepreneurship, which has been strongly supported by local government; (2) dynamic entrepreneurship, which has been supported by entrepreneurial units of universities, by government programme Ciudad E and by one of the “cajas de compensacion”; and (3) innovation-based entrepreneurship.

Barranquilla

“Barranquilla has an entrepreneurial network (...) it's an entrepreneurial network where the universities has place”. All big universities have entrepreneurial units which support pre-

incubation. There are two institutions, one university and the Chamber of Commerce supporting all the value of chain and leading the ecosystem.

This network is having influence in the Colombian Caribbean region. *“It’s showing significant results at the National level, people from other cities are visiting and looking what we are doing”*. The potential of the Caribbean is high given the port and TLC (Free commerce agreement), the network strategy is focused in promoting innovation in the established firms; this is creating conditions for corporate entrepreneurship and future spin-offs

Other Cities

Although Cali is one of the biggest cities in Colombia (2.319.648 habitants or 4.9% of the Colombian population), there were no networks supporting new technology-based entrepreneurship identified there. However, there is a network composed by the three categories presented before.

It is important to state that Cali has not had local government support. Promoting entrepreneurship there are: two universities - one of which has been promoting programmes since 1985;- the Chamber of Commerce, which has started initiatives; and one of the “caja de compensacion familiar,” which is assuming support of all the value chain for promoting entrepreneurship, including financial resources. Regarding NTBF creation, Parque Soft - a firm based in Cali, -is an incubator of the software industry which has grown successfully in the country: they are incubating more that 300 new firms in more than 13 cities in the country.

Although Manizales and Bucaramanga Entrepreneurial Ecosystems also have evolving entrepreneurial ecosystems, this research focused in the biggest cities of the country (the four represent 28.9% of the total population.) The aim was to present patterns about how different the regional networks are, and to identify the factors that may influence NTBF creation in Colombia.

Entrepreneurial Networks in Colombia and NTBF creation

“A magic formula” for having efficient entrepreneurial networks in Colombia has not been found. This can be explained by the contextual factor of entrepreneurship and the evolving dynamics of the institutions:

“We are on the way but none of the networks is efficient, there are resources available but there are no indicators of NTBF creation... the government plans are not articulated with the entrepreneurial networks or with the creation of new ventures”

Networks operate very differently according to the specific economic, social, political and cultural contexts that make up different regions (Curran and Blackburn, 1994; Morgan, 1997.) It is important to identify regional networks because entrepreneurship is a contextual phenomenon. External factors such as culture, local governments, regional vocations and access to resources, influence new venture creation.

In Colombia, New technology-based creation is not considered as a strategic typology of new venture to create. This may be linked with the diversity of definitions within actors and the failure of several technology-based incubators. Four definitions of technology-based firms were identified: (1) knowledge-based firm, (2) research-based firm, (3) firm with income higher than the average income of its sector, (4) spin-offs created as a result of corporate

entrepreneurship. Some of the actors stated that opportunity-driven entrepreneurship generates NTBF. All of them identified the important role of universities in this type of entrepreneurship, regardless of the definition.

Although all universities have offices supporting entrepreneurship, these offices are sometimes not related to Technology Transfer Offices and, therefore, the legal frameworks of technology transfer at the universities do not support NTBF creation processes. This lack of articulation inside universities, and the lack of indicators of NTBF impact, makes it difficult to establish direct relationships between regional entrepreneurial ecosystems and NTBF creation. It was determined that lack of communication within the several university schools and departments, negatively affects the university-industry-government relationship. However, entrepreneurial units contacted during data collection affirmed that many NTBF are being created, and that Colombia has human capital for creating NTBF. For instance, at the National University, Bogota, there have been created near

SENA is the only institution that has a programme (Tecnoparques) with infrastructure to support prototype design and development. Prototypes are one of the factors of success of new product development, and there are 15 Tecnoparques in 11 regions of Colombia. Entrepreneurs state that access to Tecnoparques is easy and useful. They identified that the formal entrepreneurial networks offered by the regions are not efficient, thus, they developed their own networks and identified key sources of information.

Although entrepreneurial networks are not efficient yet in Colombia, entrepreneurs develop their own networks (formal and informal) in order to gain knowledge they need, and succeed. Colombian entrepreneurs, creating NTBF in cities like Bogota and Medellin, have access to several networks. However, there is oversaturation of institutions because there are several institutions offering similar resources, which makes it harder for entrepreneurs to engage in strategic networking. In contrast, entrepreneurs from cities like Barranquilla and Cali have specific institutions offering a complete portfolio but they have not had governmental support like Medellin or Bogota.

Practitioners in the industry of entrepreneurship (managers, leaders, governors, employees) in Colombia are aware of the importance of working on improving the dimensions of their entrepreneurial networks. Their views, assumptions, interpretations, understanding, interactions and purposes give life and evolution to the systems. Their perceptions are the base for researchers to build theories and design tools to deal with that reality.

Conclusions, Implications and Research Challenges

- Although the entrepreneurial networks (regional and national) in Colombia are in an early stage and are not considered efficient, there is a vibrant entrepreneurial population creating NTBF. Moreover, several institutions are working on becoming part of a dynamic network in the chain of value of NTBF creation. A question arises: where are entrepreneurs acquiring the knowledge needed?
- There are different layers of entrepreneurial networks in Colombia, the national and regional, and in some regions, as Medellin, there are different layers of networks promoting social and/or technological entrepreneurship. All these networks are in their early stages but they are evolving. They cannot be said to be efficient yet. However,

NTBF have been created and are having an impact in Colombia's economic system. Entrepreneurs are moving within regional, national and international entrepreneurial networks searching the financial resources they need to pass the Valley of Death.

- There is a need for understanding better the factors affecting the creation of NTBF in a developing country, where entrepreneurial networks are not efficient. This enhanced understanding will help identify national and regional indicators of NTBF creation. Indicator development and measurement would help institutions -government, universities and support institutions,- to improve their strategies and practices, and to develop programmes that enhance NTBF creation.

References

- Aaboen, L., Lindelöf, P., von Koch, C. & Löfsten, H. 2006. Corporate governance and performance of small high-tech firms in Sweden. *Technovation*, 26, 955-968.
- Aldrich, H. & Zimmer, C. 1986. Entrepreneurship through social networks. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.
- Audretsch, D. B. & Keilbach, M. 2008. Resolving the knowledge paradox: Knowledge-spillover entrepreneurship and economic growth. *Research Policy*, 37, 1697-1705.
- Autio, E., Sapienza, H. J. & Almeida, J. G. 2000. Effects of age at entry, knowledge intensity, and imitability on international growth. *Academy of Management Journal*, 43, 909-924.
- Barr, S. H., Baker, T. & Markam, S. K. 2009. Bridging the Valley of Death: Lessons Learned From 14 years of Commercialization of Technology Education. *Academy of Management Learning and Education*, 8, 370-388.
- Bessant and Tidd (2007) *Innovation and Entrepreneurship*. John Wiley and sons Ltd. England.
- Birley (1985) The Role of Networks in the Entrepreneurial Process. *Journal of Business Venturing*, 1(1), 107-117.
- Brush, C. G., Greene, P. G., Hart, M. M. & Haller, H. S. 2001. From initial idea to unique advantage: the entrepreneurial challenge of constructing a resource base [and executive commentary]. *The Academy of Management Executive* (1993-2005), 64-80.
- Collinson, S. & Gregson, G. 2003. Knowledge networks for new technology-based firms: an international comparison of local entrepreneurship promotion. *R&D Management*, 33, 189-208.
- Dencker, J. C., Gruber, M. & Shah, S. K. 2009. Pre-entry knowledge, learning, and the survival of new firms. *Organization Science*, 20, 516-537.
- Dorf, R. C. & Byers, T. H. 2008. *Technology ventures: From idea to enterprise*, New York, McGraw-Hill.
- George, G. & Block, A. J. 2009. *Inventing Entrepreneurs: Technology Innovators and Their Entrepreneurial Journey*, United States of America, Pearson Prentice Hall.
- Grant, R. M. 1996. Prospering in Dynamically-competitive Environments: Organizational Capability as Knowledge Integration. *Organization Science*, 7, 375-387.

- Greeve (1995) Networks and entrepreneurship: An analysis of social relations, occupational background, and use of contacts during the establishment process. *Scandinavian Journal of Management*, 11(1): 1–24.
- Greve and Salaf (2003) Social networks and entrepreneurship. *Entrepreneurship: Theory and Practice*, Vol. 28 No. 1, pp. 1-22.
- Hoang, H. & Antoncic, B. 2003. Network-based research in entrepreneurship: A critical review. *Journal of Business Venturing*, 18, 165-187.
- Huber, G. P. 1991. Organizational learning: The contributing processes and the literatures. *Organization Science*, 2, 88-115.
- Inkpen and Tsang (2005) Social Capital, Networks and Knowledge Transfer. *Academy of Management Review*, Vol. 30, No. 1: 146-165.
- Lang, J. 2002. *The High-Tech Entrepreneur's Handbook*, Great Britain, Prentice Hall.
- Lechner, C., Dowling, M. & Welp, I. 2006. Firm networks and firm development: The role of the relational mix. *Journal of Business Venturing*, 21, 514-540.
- Lockett, A. & Wright, M. 2005. Resources, capabilities, risk capital and the creation of university spin-out companies. *Research Policy*, 34, 1043-1057.
- Martinez and Aldrich (2011) Networking strategies for entrepreneurs: balancing cohesion and diversity. *International Journal of Entrepreneurial Behaviour and research*, Vol. 17, No. 1: 7-38.
- Nahapiet and Ghoshal (1998) “Social Capital, Intellectual Capital, and the Organizational Advantage”, *Academy of Management Review*, Vol. 23 No. 2: 242-66.
- Nonaka, I., Toyama, R. & Nagata, A. 2000. A firm as a knowledge-creating entity: a new perspective on the theory of the firm. *Industrial and Corporate Change*, 9, 1-20.
- Rickne, A. & Jacobsson, S. 1996. New Technology-based Firms an exploratory study of technology exploitation and industrial renewal. *International Journal of Technology Management*, 11, 3-4.
- Shane (2000) Prior knowledge and the Discovery of Entrepreneurial Opportunities. *Organizational Science*, Vol, 11, No. 4.
- Shane, S. 2005. *Economic Development Through Entrepreneurship: Government, University And Business Linkages (New Horizons in Entrepreneurship)*, United Kingdom, Edward Elgar Publishing Limited.
- Spender, J.-C. 1996. Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*, 17, 45-62.
- Suddaby (2006). From the editors: What Grounded Theory is not. *Academy of Management Journal*, Vol. 49, No. 4: 633-642.
- Vendrell-Herrero, F., González-Pernía, J. L. & Peña-Legazkue, I. 2011. Do incentives matter to promote high technology-driven entrepreneurial activity? *International Entrepreneurship and Management Journal*, 1-24.
- West, G. P. & Noel, T. W. 2009. The impact of knowledge resources on new venture performance. *Journal of Small Business Management*, 47, 1-22.
- Wilken (1979) *Entrepreneurship: A comparative and Historical Study*. Norwood, NJ: Ablex, in Greve and Salaff, 2003.
- Yi-Renko et al. (2000) Social Capital, Knowledge Acquisition, and Knowledge Exploitation in Young Technology-Based Firms. Working Paper Series, Helsinki University of Technology, Institute of Strategy and International Business.