CREATION OF TECHNOLOGICALLY-BASED FIRMS IN BRAZIL: THE INFLUENCE OF INCUBATORS ON THE SET-UP OF NEW BUSINESSES

Ângela França Versiani[1]
Av. Dom José Gaspar, 500 - Prédio 14 – sala 113 - Coração Eucarístico
CEP: 30.535-610 Belo Horizonte/MG Brasil
Fone: (31) 3319-4957
E-mail: versiani@pucminas.br

Liliane de Oliveira Guimarães[1]
Av. Dom José Gaspar, 500 - Prédio 14 – sala 113 - Coração Eucarístico
CEP: 30.535-610 Belo Horizonte/MG Brasil
Fone: (31) 3319-4957
E-mail: lilianeog@pucminas.br

[1] PUC Minas
CEP: 30.535-610 Belo Horizonte/MG Brasil

Abstract:

This article looks at the creation of technologically-based firm from an organizational learning standpoint. It considers the entrepreneurship as a dynamic phenomenon by which managers and firms adjust their behaviors and trigger changes based on the influence of their network of relationships. The theoretical model that underpins the research had the following assumptions: i) the characteristics of entrepreneurs are one of the inputs of the entrepreneurial process; ii) entrepreneurship is a dynamic process subjected to learning mechanisms; iii) organizational learning occurs in individuals although it crystallizes in the organizational routines and actions; iv) organizational learning requires the incorporation of both cognitive and behavioral elements and v) learning is a cycle which consists of the action, reflection and conceptualization, among others. Another assumption of this article is that incubators are mechanisms for transferring managerial knowledge. Grounded on these, one introduces the results of the research, which was carried out in seven firms originated in incubators, in order to understand how the firms were organized as well as the influence of the incubators on the

creation and development of the firms. In general, the results suggest that the ties between incubators and incubated firm could be considered as weak and that the incubators had a minimal role in the knowledge transfer.

K**ey words**: technologically based new firms, incubators, organizational learning, entrepreneurship, small firms

1-Introduction

Since the 70s, discussions between either academics or entrepreneurs have become quite common concerning the emergence of an economic reconfiguration, based on the unbundling of large companies as well as on the shift from individual orientation towards a system of inter-organizational collaboration and formation of partnerships. As a result of this re-structuring of markets and companies, issues regarding the positioning of small units in the social fabric have been emerging since the 90s, whether to discuss their bases of survival or to seek an understanding of their role in the social economic division (Best, 1990; Almeida, 2002).

The fact is that "very few would fail to recognize the rise of new forms of organization" (Clegg and Hardy, 1999,p.39) and that governmental deregulation policies and the creation of economic clusters (Best, 1990; Kaplan, 1987) as well as the incentive toward incubation processes, have been adopted by various countries in an effort to encourage the creation of new businesses or to endow small firms with greater competitive conditions.

In this scenario, small technology firms have become privileged objects for investigation. Although they do not account for a great percentage of all new firms, they seem to be particularly interesting due to their contributions to the processes of economic innovation and to the configurations of our present society.

It is known that the conditions that foster their growth and back up their sustainability are different in nature and depend not only on the economic sector they find themselves in, but also on the influence by different economic and social agents. Among them, incubators stand out, seeking to minimize the risks of the venture. Usually the incubator´ offer a concrete partnering experience for will-be entrepreneurs, necessitating the notion of cooperation, trust and exchange.

It can be said that structuring a new tech firm is a learning movement, conditioned by the small entrepreneurs' previous experience and his experience in the incubator. Therefore, investigating the significance of the incubator in the structuring of start-up´s gains relevance as it may help pinpoint the conditions that favor the survival of small companies. What role do incubators have in the setup of new companies? What are the bonds between the incubators and the companies? How does the structuring process of these small business come about?

As this paper contemplates such issues, it seeks to ascertain the organizational arrangements of tech firms born in incubators, identifying the contributions and the influence of the incubators on the setup of new companies. To do that, it takes into account the specificities of tech firms and their lessons in entrepreneurship, starting from the assumption that the identity of an organization is established by the relationships developed with its context.

This article begins off by presenting the main characteristics of knowledge intensive companies and the theoretical conceptions that postulate the odds of sustaining these businesses. It goes on to summarize the main references on entrepreneurship and its relationship with the structure of up-and-coming companies. Finally, it presents the results of an empirical investigation, which clarifies the main components and variables in the structuring of Brazilian companies born out of company incubators.

2 - Knowledge Intensive Firms – a particular type of company

One of the recurring concerns in management has been the sustainability of companies in the market and their chance of growth. Such a concern gained new relevance, when the emergence and success of Silicon Valley's small tech firms became known. Since then, issues regarding the survival of small tech firms and their growth trajectories have been the order of the day, in an effort to understand their nature and their potentialities before the large economic conglomerates. The tech firms have properties that differentiate them form other types of companies, distinguishing them as a different class of company.

Tech firms are productive units typically founded by scientists or engineers, whose focus is on the development and the use of efforts in R & D, strong experimentation and a great number of highly qualified employees, including PhDs (Barbieri, 1994; Elfring and Hulsink 2001; Starbuck, 1992). Also known as knowledge-intensive companies, these firms

have been singled out as instruments that generate new sources of competitions, complementing and stimulating industries, and even developing markets, either through new technologies or through the combination of old technologies. Their peculiarity revolves basically around their capacity for innovation, where human capital outweighs physical capital or labor and the abundance of technical expertise is their main asset and that which ensures the possibility of continued innovation.

The process of innovation is a search movement that defines and is defined by the dynamic technologies pertaining to the sole ownership companies and to specific sectors. That means that each firm, or set of firms, holds a wealth of capabilities to acquire, assimilate, use or create technologies.

In principle, these capabilities, also known as technological capabilities (Canuto, 1982), are necessary in the process of carrying out projects and/or product development. In other words, innovation processes come into play as expertise is built up by firms which are capable of promoting changes of a technical nature. Hence, the importance of groups of professionals with great expertise inside these companies, i.e., the content of knowledge and the channels for its application. And mainly, their capacity for developing **search processes** based on 'know-why' issues. In this sense, the process of innovation is a search movement conditioned by the individual repertoire of knowledge and skills acquired by individuals in their lifetime. It stems, on a corporate level, from an organizational learning established by the firm's cumulative activities over the years, where the technical corps of professionals act as energizers.

According to Rafta and Zollo (1994) rarely can tech firms develop procedures, methodologies and internal standards independent of the characteristics and the professional skills available. Thus the firms' technological talent will be strongly related to the technical staff and the methodologies that they use.

From this perspective, we gather that the differences in the technological talent of the firms take place as a result of the relative autonomy of the professional agents and the range of opportunities and restrictions in their innovative search. These factors, though, cannot be overestimated. In this movement, one must consider the definition of the firm's size and market niche as well as the inter and intra firm relationships.

Expectations as to the economic return on the innovations must also be taken into account. Economic calculations and innovative efforts have significant interdependences conditioning the individual trajectories of the firms. Henceforth, we gather that some firms

will be better positioned than others in the implementation and use of innovations, though they operate within the same sector and deal with the same competitive conditions (Rafta and Zollo, 1994).

Large firms generally have plenty of both human and financial resources in order to position themselves in a more aggressive manner as to the processes of innovation and competition. There is no denying that oligopolistic structures have the central role in the business world. On the other hand, though, it is known that they cannot exercise a totalizing role. Lack of technological continuity on the part of these oligopolies, combined with entrepreneurial planning factors and the economic division of the capitalist system, are decisive factors in the performance of small and medium companies.

Moreover, innovation in a small company differs quite substantially from that in big companies. According to Solomon (1986), the small company devotes itself to R & D genres that demand fewer financial resources and a high degree of specialized knowledge, performing in highly unstable markets. Innovative process is developed on a trial-and error basis, unlike that which takes place in large R & D labs. He also points out that for economic, planning and organizational reasons, big companies leave enough room in the market for small productive units that set out to explore and develop new markets niches.

These small enterprises are said to stem from such diverse situations as: a) response to market mutability, b) 'absorbers' at times of economic transition, c) complementary business to those big companies. So much so, that when they are very successful it becomes common for these companies to be acquired or even to see some kind of strategic alliance with small productive units. In fact, this has been a model that has promoted the permanence and survival of the small business as they become protected by the guardianship of a parent company.

Therefore, it can be said that there are possibilities of performance or even growth for the small tech firms so long as they stay out of the interests of the big capital, or work with it in a complementary manner or in some sort of partnership. The small and medium firms can meet the requirements of innovation as demanded by the system if they adjust themselves to the big firms' strategies and the level of dependence on the relationships between small companies and big ones is the condition underlying the behavior and the unique selling points of the former.

The literature suggests that survival and growth of knowledge intensive small and medium companies are conditioned on some factors like: structural incentives for innovation, availability of both human and technological internal resources and the resources of the

network which the firm is part. Indeed, active participation in business networks seems to be one of the key factors not only for the set up but also for the survival of those businesses.

3 - The Creation of a Company: entrepreneurship and network of relationships

Traditionally, there are two so-called classic approaches to studying the setup of a company, namely: the economic approach and the psychological approach. Among those standing for the economic approach are Jean Baptiste Say, Schumpeter and Penrose, as individuals who have somehow emphasized the entrepreneur as an important element in the process of economic growth and development. On the whole, these authors emphasize the entrepreneur as the driving force behind the business and as a key element behind its expansion.

This approach is complemented by the psychological perspective that stresses the personality and the behavior of these individuals, believing that entrepreneurs have behaviors and personalities marked by three dimensions, namely: *the innovation dimension*, referring to creativity, that is, the capacity of the individual to discover new solutions to problems and necessities; *the risk dimension*, involving the individual's disposition to venture into unknown and risky situations, and *the action dimension*, related to perseverance, adaptability and responsibility for assuming failures (Morris et al., 1994). It is worth pointing out that these behaviors and characteristics tend to be associated with successful entrepreneurs (Deakins and Freel, 1998), who are identified as people endowed with exceptional qualities.

Although these perspectives are mainstream in management science, they are not free of criticism. On the contrary, there are various viewpoints and studies (Vries,1985; Versiani and Gaspar, 1998) that down play the romantic vision of the power and glory with which some business leaders and entrepreneurs are characterized, pointing out the frailty of that category as an explanatory element.

Deakins and Freel (1998) categorically affirm that both the economic perspective and the psychological one have a static nature and are not capable of grasping the essence of entrepreneurship. To them, entrepreneurship is associated with a process of change in which behaviors are bound by adjustments and changes according to the fabric of relationships and context to which they are subject. Morris et al (1994) advocate more dynamism to the phenomenon, seeking to address a more relational focus, considering it as something with multiple dimensions determined by inputs and outputs.

Such considerations have led one to examine a company's set up through various aspects, ranging from the identification of the companies' internal factors to the social and contextual elements in which the firm establishes its interfaces. As a result, new elements are incorporated into the social and demographic factors as conditions for the manifestation of the entrepreneurial behavior.

One of the authors highlighting this perspective is Young (1971), who developed an interpretation called macro-sociological where the focus of analysis is preponderantly geared to reference groups. To this author, any manifestation of the entrepreneurial behavior reflects values, beliefs and attitudes shared by the member of several groups which exert influence not only on individuals separately but also on the company as a social unit. The focus of analysis shifts from the individual or from the market to larger clusters such as the ethnic market, occupational groups, politically driven factions or even relationships and influences on the part of stakeholders.

The insertion of entrepreneurial activities or the expansion and innovation of businesses are not considered in isolation or independently. Rather, it is the result of a role that reference groups play for those who start their own business, and who exert influence during his entrepreneurial operations. After all, they are the ones who provide the entrepreneur and his productive unit not only with an initial outlay but also with knowledge, advice, information, indications and references as to the ways or the actions to be undertaken.

Thus, the relationship and their bonds, through networking or solitary structures are emphasized so as to understand the beginning and the development of companies, representing a substantial distinguishing feature for the obtainment of positive market and financial results.

The entrepreneur's network is thought, therefore, to play an important role in the discovery of new opportunities, resources and improvement in performance. The start-up firm can be seen as an interactive process in which the numbers of both formal and informal relations influence the entrepreneur to find opportunities and to gain legitimacy and to learn about the significance, the extension and the nature of the management of his business. Thus, entrepreneurial behavior, the set-up and expansion of companies stem from a process of acquired learning, as a result of a series of relationships and reactions to critical events where actions, strategies and decisions are fine-tuned.

Some authors like Powell et al. (1996) argue that when the knowledge base of an industry is complex, the locus of innovation is not to be found in sole proprietorship

companies but in learning networks. His research shows that the size of the tech firm is a result of their capabilities to establish inter-organizational relationships. What is more, that the firms involved in cooperation grow more rapidly than those that neglected such partnerships.

In certain way, it can be understood from such a finding that relationships with high degree of trust or strong bonds seem to thrust companies toward expansion, as collaboration contributes to develop internal competences. Looking for relationships among the types of bond in the different stages of the company, Elfring and Hulsinck (2001) propose that in the initial phase of the company, family and other strong bonds play an important role, but as it grows, relationships of a more formal and secondary nature come into play. They point out that strong bonds are important to acquire resources and explore the opportunities while the weak ones enhance the entrepreneurs' ability to find and to tap into opportunities.

The fact is that research into tech firms (Rafta and Zollo, 1994) show distinct organizational strategies and arrangements according to their age and specialization. While in the first stage (1 to 3 years) the firm's network activities is extremely limited and generally based on the entrepreneurs' personal relationships, in the 2nd stage (3 to 7 years) there is a necessity for a broadening of the network, seeking to change the position of its technology and its market. So that in the third stage (over 7 years) it can acquire centrality of relationships, accessing and incorporating new procedures to support its capacity for production and innovation (Rafta and Zollo, 1994)

In this sense, the challenge of growth lies in the capabilities to merge institutionalization with flexibility for innovations, where each stage calls for a different professional and technical skill as well as distinct organizational arrangements. If each stage has its own distinct characteristics and dynamics, it seems evident that the knowledge intensive firms have complex, even chaotic, arrangements, in which it is necessary to consolidate central routines around loosely planned activities with the intention of accessing information and knowledge sources available in its relationships.

Empirical evidence has shown that small companies' capabilities for innovation and growth is tightly associated with professional relationships and capabilities for developing partnerships and collaborators. According to Powell et al (1996) growth is a process that requires time and, as opposed to what happens to the biological species, does not result from age. Rather, it starts with collaboration. The growth of tech firms is linked to the benefits brought on by their network.

Given the facts above, it is fair to affirm that the process of setup of a tech firm and the basis for its growth is a highly complex one, basically grounded on uncertainty. There are several requirements demanded by these ventures, ranging from the head for technological specialization, the development of internal resources to the acquisition of external source information. The merger of innovative processes with the structuring of businesses becomes the main challenge. In order to reach a sizeable market position it seems that the companies should be surrounded by a business network that support them.

4 – Methodological Considerations

The set up of new high-tech business ventures which were initially supported by incubators drove us to investigate the nature of the relationships between these ventures and their incubators. Specifically we examined the role of incubator in the process of creation of new business. Our assumption is that the incubators enable the companies to access knowledge in order to reduce the uncertainty of new businesses. Based on these considerations we conceptualized the incubators as the loci of learning and, as a result, a key actor in the business network.

Thus, the research was organized by outlining its scope by means of the definition of its specific objectives, namely: to identify the profile and the role of the researcher-entrepreneur in the structure of the business, to ascertain the evenness and the variations in the story and in the patterns of the incubated companies, to identify the nature of the bonds developed between the incubator and the incubated companies. Hence, we opted for a theoretical and epistemological model, based on the following dimensions:

4.1 - Conceptual Construction:

The conceptual construction of this research is firmly grounded on the theoretical principles of entrepreneurship, organizational learning and the 'network' model, and is guided by the following emphases**:**

- People's entrepreneurial characteristics are one of the inputs of the entrepreneurial process;
- Entrepreneurship is a dynamic process, made up of a learning movement.;

- Organizational learning takes place through individuals but it becomes crystallized in the organizational routines and actions;
- Organizational learning presupposes the incorporation of both cognitive elements and behavioral elements;
- Networks and alliances are turned outward;
- Incubators and companies partners, i.e., they join strengths and start fighting for each other;
- Learning is a cycle which consists of the following flow: action or experience refers to the common sense, reflection the search for the construction of meaning, conceptualization, the process of interpretation of events and creation of mental models to explain it (Kolb,1976).

4.2 - Characterization of the research

After limiting the scope of this study, a descriptive research of an explanatory nature was carried out through the use of case studies. The sample selection followed theoretical criteria, and was built on account of the phenomenon researched. Thus, we obtained information about the chart of Brazilian incubators through ANPROTEC's [1].

The cities of Belo Horizonte and Santa Rita do Sapucaí have the highest number of incubated companies – 19 each one. Considering the financial limitations of the research, we chose to carry it out only in the region of Belo Horizonte. As we saw it, such a methodological profile would not compromise the significance of the study, as it would show the profile of incubated companies of the region which accounts for 35% of all incubated companies in Minas Gerais. Out of 19 companies we were able to get in touch with 13. Seven agreed to participate in this research.

As such, seven companies were interviewed through a semi-structured interview guide. We basically interviewed the entrepreneurs who initiated the companies. Then we defined an analytical conceptual plan, setting axes for analysis. We elected the following parameters: Incubator's Performance: the incubator's capacity to offer the necessary resources to provide the companies with the structure needed for sustainability in the market. Interdependence principles: quality of the relationships established between the incubated

[1] anprotec (associação nacional dos parques tecnológicos e incubadores de empresas).the national association of technological parks and business incubators.

companies, incubators and their context. Trajectory: path covered by a company in order to place itself in the market. The figure below the analytical model.

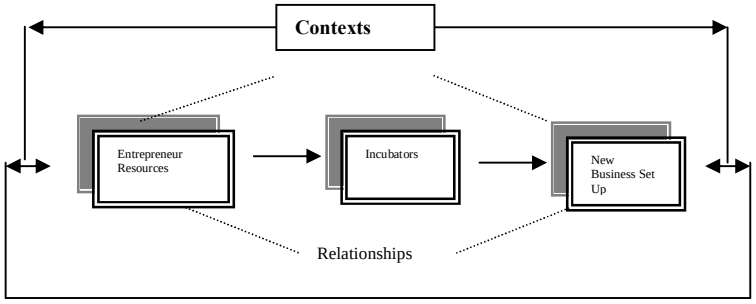

Fig1-The Process of New Business Set Up

5- Results of the investigation

Analysis and confrontation of the data haul depicted a situation of heterogeneity of the sample interviewed concerning the profile of the entrepreneurs and the structuring process of the young businesses. Such realization meant approaching the data in a segmented manner, comparing the experiences of the incubated companies according to the market segment of the companies: biotechnology vs. computer science, and it also meant disregarding an interview if a certain company originated from a multi-sector incubator.

5.1-The entrepreneur, the structuring of the business and the role of incubators

The interview guide endeavored to understand the dimensions that could categorize the entrepreneurs of incubated companies, aiming to identify similarities that would characterize them through a social identity of their own. As to the demographic characteristics, the entrepreneurs in the biotech sector differed considerably from Timmons' concept (1994) in that successful entrepreneurs are in the mid-thirties and that in tech firms there is a strong tendency for entrepreneurs under the age of 30. In the cases studied, age was no barrier to entrepreneurship. On the contrary, on the whole, entrepreneurs were in their mid-50s and with a vast professional experience. Regarding education, marital status, number of children and religion, there is homogeneity among the interviewees. They are catholic,

married with children, and hold university degrees, some even a Master's or a Doctorate. They are middle children, which contradicts some authors' beliefs that the eldest child is more likely to become an entrepreneur (Plaschka, 1990; Dolabella,1996).

Another aspect very much publicized by the literature on entrepreneurship (Young,1971;Timmos,1994; Bygrave, 1997) stresses the importance of paternal influence, of mentors and of the circle of friendships as constitutional of entrepreneurial behavior. Such an influence, or the importance of strong or primary bonds in the setup of the business seems to keep quite particular proportions in the present sample. In other words, there is no one standard that homogenizes the group studied. Each one attributes a specific and unique importance to the social groups of reference. For instance, there are interviewees who recognize the importance of their parents' professional background as an influence in their decision to become entrepreneurs while there are others who have not been influenced by family.

They unanimously reject the idea of having been influenced by friends or by their educational background. They point out that they ventured into their new businesses without any support from their reference groups. The dimension of innovation, risk and action come up in their speech as they describe the motivation behind the new venture - setting up the business, the development of the product and even the stages structuring the company.

> ( )"the problem I had was a serious one, I mean, I had come up with an idea but had no one to make it real for me. There were no companies willing to do research, they saw it as just an idea and turning an idea into a product is a long and painful process, which I knew I had to go through, though."
>
> (...) " Alone, I mean, because nobody believed in the idea. It was a crazy idea, they would say to me, they would call me crazy and would not take me seriously until things started happening."
>
> "(…) For instance, I have an acquaintance who makes prostheses from a calcium-based product or something, and he, when I started out as an entrepreneur he went like: don't do that, don't mess around with that kind of market because you'll be through in no time. You're gonna clash into big business and you're not gonna be able to make it. I mean, he poured cold water on my idea."

The necessity to fulfill dreams not only underlies the accounts but also come up consciously as the entrepreneurs attempt to define themselves. The researchers-entrepreneurs see themselves as innovators, tenacious and relentless when it comes to their involvement with their work. The fact that they are fully committed to innovation is a common characteristic to all interviewees in the biotechnology sector. They get wholly involved with the development of the products and the projects, striving cognitively, emotionally and behaviorally to implement them.

> "(…) I introduced a novel product into the market".
> (…) " I'm gonna give an example of a company's failure in the market. There's this American company, which oriented its product for low myopia. Did it make a good product? It did. Does it correct low myopia? It does. So, how come the company went broke? It invested US$ 800,000 American dollars and I didn't. It went bust but I didn't. You call that a change of paradigm, right? Its paradigm was wrong. (…) mine was right. It took a new approach to an old unresolved problem."

Motivations to join the incubator and the perception as its contribution are also similar among the biotechnology entrepreneurs. They heard about the incubator through people in their secondary reference circles, colleagues and friends, who told them of the potentiality of the mechanisms. From then on, they joined the incubator with the primary goal of developing a specific project, be it a product or a new market niche to penetrate.

It must be pointed out that in every one of the cases studied, they had somehow already worked as entrepreneurs and say they approached the incubator looking for the facilities and low cost equipment with which to bear the projects that would then be added to the existing mix. They also believed that participating in the incubator would lead them more easily to existing sources of funds, thus contributing to the expansion of their businesses.

> "(…) First there was the trouble with structure. As we owned the brand, we felt we needed more structure because we had this small company, which was a dealer and we needed more structure, in order to use a lab, because we really needed this lab structure, so we came to the incubator."
> "(…) Well, first I figured it would be easier for me to get some structure, in terms of entrepreneurship, because I'm a doctor and didn't know the first thing about

> running a business. Then I also figured it would be a way for myself to gain access to some sort of line of credit, which is such a hard thing to obtain. So I figured looking for the incubator was the best thing to do.

As far the incubators' role is concerned, the interviewees seemed content with the experience of being incubated. They categorically affirm that permanence with the incubator favored the existence of their company, in addition to broadening their horizons, contributing to their personal development. To them, the incubator provided access to both public and private institutions, as well as the means through which to register their product as well as access to the certificates required by the permanent regulatory agencies. They acknowledge the incubator as a facilitator in operational and administrative issues.

> " (…) one of the aspects the incubator contributed was the ISO certification, as the project was born in the incubator." "(…) we already had a commercially consolidated company, that contributed a lot, because if we had to wait for the incorporation of the company to start registering the product, that would have set us back big time."

There is also a consensus among interviewees, that the incubators facilitate the exchange of information and the participation in events that contribute to your professional and personal education. The interviews bear out the theory that the incubator is a way of establishing bonds, meaning a sense of belonging to a specific group and developing support and solidarity to the established network. So much so, that the interviewees keep contributing to the upkeep and survival of the incubator.

The analyses of the interviews lead us to identify the presence of cohesion between interviewees and incubators, as they do not explicitly disclose sources of conflicts among the partners. When asked about the incubator's possible weakness in supporting the entrepreneur, they do not show any relevant discontent. They somewhat had expected the incubator to be more agile but these remarks do not compromise the quality of the relationship established.

In the cases studied, the entrepreneurs do not establish a close involvement in the daily life of the incubator. The incubator's structure is used only as a support in the configuration of the project-mainly when it comes to disseminate the use of specific techniques of administrative proceeding, such as product certifications and registrations.

The bonds between both are weak despite the mutual respect and solidarity, and do not enable the transfer of knowledge that would represent significant changes in administrative or strategic behavior. So much so that the sector's entrepreneurs do not consider that the incubator was capable of changing their vision of the business, nor promote changes in their entrepreneurial behavior, despite the seminars and programs offered.

This distance between the partners is also corroborated when entrepreneurs are asked about the services provided by the incubator and the relationship with the incubated companies. They cannot in general evaluate the difficulties, through which the incubated companies go, on the whole, to be structured and placed in the market.

> "(…) we felt the relationship was good. It's difficult to evaluate the day –to-day relationship, though. We basically used the training programs. As I didn't use the other services internally, I wouldn't be able to tell.
> "(…) I don't know because in fact we had a partial type incubator, since we were already established in the market. So I don't think I can answer that question."

The fact is that the companies born in incubators, one of which was a branch of a foreign company, were not totally devoid of experience. Their founders already had some presence in the market. For instance, the number of employees ranges between 5 and 50 employees, in spite of a 2-3 year incubation. It can be noted, therefore, that the technological expertise withheld by the company, that is, its capabilities to acquire and create technologies seems to differ among group. That is, there are both radical and incremental innovations, as well as explicit differentiations in the historical trajectory of the businesses.

Still, even with the uniqueness of each entrepreneurial trajectory, it became evident that the sector's entrepreneur did not get involved with administrative organization and /or establishment of managerial controls. In all cases, they skive the topic of management, rather preferring to delve into the product's features and the difficulties they've encounter for commercialization. Thus, the group is more focused on the introduction of the production into the market, revealing an entrepreneurial identity that is grounded on the innovation of product/process, which becomes credible through the image of entrepreneurs/researcher.

Thus, an alloy of identities, product/company/entrepreneur-researcher is processed, wherein the greatest concern lies in acquiring credibility for the product / company. In focusing on that aspect, companies have played down the necessity to keep the internal

capabilities for innovation through the incorporation of collaborating specialists in the technical center. It can be noted that the technological talent of the companies is grounded exclusively in the professional capacity and skill of this founder. These entrepreneurs show no signs of involvement in the daily administrative managerial aspects of running a business. Such tasks are delegated to a team of workers, who are distributed in different departments. It is worth mentioning that all companies seemed relatively well structured as far as the traditional management functions are concerned.

Comparing the profile, the characteristics of the companies and the perception as to the contribution of the incubator in the development of the businesses of the incubated companies of the biotechnology field with those of computer systems, some similarities and different factors can be noticed.

The entrepreneurs in the field of computer science present a demographic profile with different characteristics than those in the area of biotechnology. Aged around 26, they are unanimously single, recently graduated and with little professional experience. But coincidently with those in biotechnology, they reject the proposition that "entrepreneurs tend to have children at an older age in almost 60% of the times" (Dollabella, 1999,p.47). In fact, the cases have demonstrated that graduate entrepreneurs are middle children. The interviewees consciously reveal that their parents' professional background did not influence them at all, nor did close friends. Nonetheless, they recognize the importance of their education in determining their careers. According to them, the necessity to accomplish new things and the desire to be their own bosses were encouraged in graduate courses they took and were reinforced in their permanence in the incubator.

The fact is that perseverance, adaptability and responsibility are common traits to all these entrepreneurs. They emphatically speak about the driving force behind the setup of a new business.

> "(…) the main reason why I set up my own business is that I can trace my own way and follow it. (…) there's something I want to talk about, that if you have a will, an objective you go for it. You pursue it and eventually get to reach it".

Similarly, both the entrepreneurs in the field of IT and those in biotech insist on mentioning that an action-and risk oriented behavior is inherent to them, with no influence from their primary groups of reference.

The disposition to venture into unknown situations is natural for these entrepreneurs, for in their vision what makes a company successful in the area is the launch of new products and the capabilities for diversifying their products, choosing to opt for innovations in the form of commercialization. They have not worked on developing their technical staff which would let them acquire new innovative capacities. The incubated companies have around four employees and work toward expansion by aggregating outsourced groups.

> (…) "no, but I did introduce changes in the way the services were commercialized" .(…) "I'm not gonna say it was a novel model but we did make some very significant changes, both qualitywise and pricewise. All our competitors used to work with high prices for few people".

The fact is that these companies are not so active in launching products as they are in providing services developing IT solutions. In that respect, they differ significantly from the biotechnology firms in the dimension of products developed, as well as in the structure of their businesses.

Unlike their peers in the biotechnology firms, the IT entrepreneurs have a considerable overlap of financial/administrative tasks and service/product development tasks. There are clear indications that they delegate less than their Biotech counterparts, the IT entrepreneur being the central and centralizing actor throughout the technical and managerial processes.

The data demonstrate that the IT firms are still at a preliminary stage of company setup, considering that the management practices adopted are still quite rudimentary and amateurish and take place through continual trial and error.

When the incubated companies first teamed up with the incubators, they had a good many expectations, one of which was the low cost of the facilities offered by the incubator. Legal assistance, the possibility of sharing the same physical structure and access to funding were regarded as the main motivations for the incubation process.

> (…) lack of funding to move the project without the support of an incubator"( )
> "we joined up with the incubator because a small company cannot afford ( )"
> overheads, like office boy, receptionists, and stuff"
> (…) " the most important things were the physical structure and such services as legal assistance"."

Nonetheless, after participating in the incubation process they recognize that the incubator provided them with other advantages, such as: extension of their networks, exchange of information, and most of all a direction concerning future businesses when examining their business plans and providing them with the means to improve on them. The experience as an incubated company enabled them to understand that entrepreneurship calls for the type of behavior capable of dealing with situations punctuated by risks and uncertainties, and by the permanent search of innovations, helping them to build a positive image of themselves.

> (…) the incubator offered legal assistance, a software to help us draw up a business plan, guidance, evaluation and so on".
>
> (…) "well, at first the incubator was important for us concerning this structure thing, and we also benefited from good networking…. The incubator also offers a lot of courses, which helps you to improve…"

The interviews demonstrate that the business plan gave all of them a sense of direction and that business management is punctuated by an instrumental rationality in its administrative process. Thus, the incubator enabled them to develop notions of organizational planning, as well as point out the importance of the cause-effect relationship in the day to day of a business organization.

This learning environment influenced by the incubator seems to have been facilitated by the intense relationship between the two parties. Unlike the incubated biotech companies, these lived the day-to-day process of setting up a company within the incubator's facilities. Maybe this closer proximity makes them have a more critical view and an ambiguity of feelings towards the incubator, pinpointing the flaws in the relationship, as well as having the clear vision of the difficulties experienced by the incubated companies.

For them, the greatest difficulties in placing the companies in the market are related to the closing of the first deal, as well as the company's lack of credibility and lack of understanding of the way that the market works. They resent the fact that the companies did not help them effectively in the process. The incubator did not provide them with managerial knowledge or notions on market and competition. Rather, it was up to each company to figure

out all that as a result of trial and error, without a systematized reflection on the underlying meaning to their actions

They point out that the incubator is not only a place for partnership and collaboration, but also for competition. They outline this dimension when they recognize that the incubator's senior managers, in general, are also owners/partners in IT companies, and that the insertion of the incubated companies into the market becomes subordinated to the senior managers' endorsement to the potential contracting company. They seem embarrassed and disconcerted to be submitted to that.

> (...) "the incubator's senior managers are also owners of big IT companies, and they are always watching our ideas closely and our moves. The incubated firms end up having to develop political relationships so as not to be boycotted in their own projects. It is a common complaint on the part of the incubated firms that the competition established by the managers themselves is a constraint in terms of market entry".
>
> (...) "it is a little embarrassing to say, I mean, the relationship with the incubator is good, as long as you comply with some impositions. Let's put it this way: it's good, depending on management, though."

Nevertheless, they recognize the advantages of an incubation process and value the benefits of the relationship. They have kept in touch with the incubator, but unlike the biotech entrepreneurs, they do not allocate financial resources. Their main relationship is that of evaluating new projects for companies undergoing the selection process. It is worth mentioning that in both groups the incubators provided the exposure of the entrepreneurs to new relationships and sensitized them as to the nature of entrepreneurial activity, but still do not appear to be mechanisms of managerial knowledge transfer. The entrepreneurs' accounts demonstrate that they still have not completed the 'reflection and conceptualization' cycle in order to come full circle in the learning spiral, leading us to believe that knowledge still remains in its tacit form and under elaboration.

5-Final remarks

Considering that this study proposes that company incubators are mechanisms of accessing or transferring knowledge, we realize that such a role is quite incipient. It is still limited to sensitizing companies as to the meaning of entrepreneurship and to advising them that management is grounded on planning and organization.

The incubators did not seem to have significantly influenced the entrepreneurial behavior in such a way as to strengthen the firms' autonomy, favoring financially, for instance, the technical personnel rather than the managerial staff or providing access to inputs and greater market share and even partnerships with other companies. Nor did they seem to favor the construction of a mindset on the part of the incubated companies regarding management related issues or regarding the foundation that could back its innovation processes.

It became evident that each company has a unique trajectory with much more variability than convergences. They do present a common arrangement as far as their technological capacities are concerned, i.e., the innovation processes are peculiar to each founder's individual repertoire and do not amount to established organizational routines or to the hiring of a specialized technical staff.

Data reveal that the nature of the bonds developed between the incubated companies and the incubators are in line with the following variables: a) involvement of the incubated firms in the day to day of the business, b) the strategic focus of the firm, c) the identification of the incubated individual with his/her profession. In this dimension, the two classes of companies, biotechnology and IT, have distinct differences in the quality of their relationships. Whereas the former fosters a more cohesive and individual relationship, the latter has a more organic quality to its relationship**,** as an incubated company. It must be pointed out that despite the difference in quality of the bonds expressed by both groups of incubated companies, they did not have any contrary effects on the organizational learning process.

The experience of incubating undoubtedly nurtured the notion of cooperation, yet did not necessarily entail a consensus of the ways through which to implement the group's objectives. The cases reveal that, the greater the involvement between the incubator and the incubated company, the stronger the bonds become, consequently conflicts may arise, which may cause confidence to be shaken up. That does not seem to damage the relationship, since the interdependence between both is relatively small and weak. In other words, the incubated firms did not present themselves as dependent upon the incubators during the incubation

stages. On the contrary, they show signs of independence from their inception to the establishment of their directives.

The fact is that the incubators did not turn out to be effective mechanisms for the transfer of managerial knowledge. The incubator did not provide the incubated firm with the kind of learning that could foster reflection or construction of meanings regarding managerial practice. What stood out, indeed, was its role as a sensitize to entrepreneurial nature and attitude or as a driving force in the acquisition of the basic administration techniques, such as in the drawing up of a business plan and in assisting with accreditation proceedings.

Thus, the incubator's performance was based on an instrumentalized utilitarian logic on the part of the incubated companies, where the means-ends calculations of solutions to their routine problems prevailed, like for instance, the super valuation of the incubator's facilities. The interviewees' accounts did not display any values resulting from the incubation. They recognize, though, the incubator's aptitude for promoting networking, contributing to personal development and exchanging permanent information. These benefits alone, however, were not capable of bringing about changes in managerial behavior.

The managerial group did not migrate to the firm's strategic positions. There is still an overlap of activities and a strong identification with the product. The nature of the entrepreneurial network is still quite small, punctuated by the entrepreneur's personal relationships. The companies present clear deficiencies in the incentives for innovation and in the availability of internal resources, but its leaders are committed to making their businesses succeed.

References

ALEE, Verna. **The Knowledge evolution**-expanding organizational intelligence.Washington: Butterworth-Heinemann,1997

ALMEIDA, Paulo Henrique. Pequena empresa e desenvolvimento local: os limites da abordagem competitiva. In: FISCHER, Tânia (org.) **Gestão do desenvolvimento e poderes locais**: marcos teóricos e avaliação. Salvador: Cada da Qualidade, 2002.

BARBIERI, José Carlos. Pólos Tecnológicos e de modernização: notas sobre a experiência brasileira. **Revista de Administração de Empresas**.São Paulo,v.34,n.5,p.21-31,set/out/1994.

BEST, Michael**. The new competition – institutions of industrial restructuring.** Cambridge: Harvard University Press, 1990.

BYGRAVE, William D. The entrepreneurial process. In: BRYGRAVE, William D.(Ed) **The portable MBA in entrepreneurship**. Estados Unidos: John Wiley e Sons,Inc.1997.p.1-26.

CANUTO, Otaviano. Mudança técnica e concorrência: um arcabouço evolucionista. **Texto para discussão** n.6. Campinas: Instituto de Economia da Unicamp,abril,1992.

CLEGG, Stewart R., HARDY, Cynthia. Organização e Estudos Organizacionais. In: CLEGG, Stewart et al. **Handbook de Estudos Organizacionais**- modelos de análise e novas questões em estudos organizacionais. São Paulo: Atlas,1999. p.27-59.

DEAKINS, David, FREEL, Mark. Entrepreneurial learning and the growth process in SMEs. Bradford: **The Learning Organization**;v.5,n.3,p.144-155,1998.

DOLABELLA, Fernando. **O segredo de Luísa**. São Paulo: Cultura Editores Associados, 1999.

ELFRING, Tom, HULSINK, Willem. Networks in entrepreneurship: the case of high technology firms. Paper Submitted to Small Business Economics,Rotterdam,February,2001.

KAPLAN, Roger. Entrepreneurship reconsidered: the antimanagement bias. **Harvard Business Review**,v.69,n.3,1987.

MORRIS, Michael H. et al. Reconceptualizing Entrepreneurship: an input-output perspective. **SAM Advanced Management**,1994.

PLASCHKA, Gerhard. Person-related and microsocial characteristics of successful and unsuccessful entrepreneurs. In: DONCKELS, Rik; MIETTINEN, Asko. **New findings and perspectives in entrepreneurship**. England: Avebury, 1990.

POWELL, Walter W; KOPUT, Kenneth, W; SMITH-Doerr, Laurel. Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. **Administrative Science Quarterly.** Ithaca,Mar,1996.

RAFTA, Mario, ZOLLO, Giuseppe. Sources of innovation and professionals in small innovative firms. **International Journal of Technology Management**,v.,n.3/4,p.481-496.

REEDING, John C, Catalanello, RALPH F. **Strategic Readiness**: The making of learning organization. San Francisco: Jossey Bass,1994.

SOLOMON, Steven. **A grande importância da pequena empresa**- a pequena empresa nos Estados Unidos, no Brasil e no Mundo. Rio de Janeiro:Nórdica,1986.

STARBUCK, William H. Learning by knowledge intensive firms. **Journal of Management Studies**,v.29,n.6,p.714-740,1992.

TIMMONS, Jeffry. **A new venture creation-entrepreneurship for the 21st century**. Boston:Irwin,1994.

VERSIANI, Ângela, F. GASPAR, Renata de Magalhães. Diferenças e Similaridades das micro,pequenas e médias empresas do segmento de confecção na RMBH. **Relatório de pesquisa.** Instituto de Ciências Econômicas e Gerenciais-ICEG/PUC Minas,Belo Horizonte,1998.

VRIES, M.E.R.K. The dark side of entrepreneurship. **Harvard Business Review**, p.160-167.1985.

YOUNG, Frank W. A macro sociological interpretation of entrepreneurship. In: Kilby, Peter(Ed).**Entrepreneurship and economic development**. New York:The Free Press, 1971.p.139-149.