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Jacques Arlotto, Jean-Michel Sahut, Frédéric Teulon

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Jacques Arlotto[a], Jean-Michel Sahut[b], Frédéric Teulon[c]
[a] Associate Professor, Director of the incubator, Audencia Nantes - École de Management, France
jacquesarlotto@gmail.com
[b] Professor, Geneva School of Business Administration, Switzerland & CEREGE EA 1722, University of Poitiers, France
jmsahut@gmail.com
[c]Director of IPAG Lab, France
f.teulon@ipag.fr

ABSTRACT

This article examines the performance of incubators because their economic model implies constantly finding external sources of financing. In order to evaluate the performance of incubators in France, we questioned 404 entrepreneurs in 80 incubators. The results show the social utility of incubators in France. Indeed, they encourage entrepreneurs to pass to the act of creation, but also contribute to the success of incubated firms. Moreover, these companies create more jobs than other start-ups. However, the services provided by incubators could be more developed and focus more on the assistance in order to find potential investors. Lastly, the work quality of an incubator as perceived by entrepreneurs is largely dependant on its director. This fact can explain important variations of performance between incubators.

JEL Classifications: L26, M13

Keywords: Incubator; Entrepreneur; Performance; Coaching; Stakeholder; Investor; Entrepreneurship; Diploma; Education

I. INTRODUCTION

Over the last 50 years[1], incubators spread across the whole world, and for a few years they have been created by a growing number of economic actors (local collectivities, universities, large companies, etc.). Their economic models have evolved, their objectives have diversified, and, with the experiment, a specific profession, business program manager (a sort of developer guide of start-ups) was born. Today, incubation is a real profession - Americans call it an industry- which has its methods, tools, standards, and its professional structures. However, it remains a young model in permanent evolution.

The economic model of incubators implies finding constantly external sources of financing because the incomes resulting from the sale of services to the incubated companies are not enough to ensure their finance equilibrium (Loss = 0). This is why the majority of incubators use directly or indirectly public funds. Taking into account their cost, the stakeholders of incubators, and more particularly the people who finance them, generally estimate that incubators must influence, first of all, the survival of incubated firms and the employment of this kind of enterprise, then consequently, the taxes collected (local and national). Two points (employment and taxation) would ensure thus, if the firm is successful with a certain return on investment for the public investor.

Our research thus aims at determining if the incubators allow the incubated companies (who they accompany[2] during the first months of their activity) to be more efficient and perennial than start-ups which don't use their services.

In order to evaluate the incubators performance in France, we questioned 404 creators in 40 incubators. We sought to appreciate if the fact of being installed in an incubator essential in entrepreneurs' decision to create, to establish the really important services for them, and finally to evaluate the determinants of the work quality provided by the incubator team.

The remainder of the paper is organized as follows. Section II presents a review of the literature on incubator performance. In Section III, we detail our assumptions of research and methodology, and then we analyze the results of our empirical study. Section IV concludes and makes some recommendations on the process of incubation.

II. THE PERFORMANCE OF INCUBATORS: A REVIEW

A. Definition and the Role of Incubators

There are several definitions of incubators in the literature, especially in France where researchers try to define the typology of incubators following their origin and organization (non-profit versus business incubators), their sector (technology, manufacturing, services, mixed-use, etc.), their stage of intervention (early stage vs. later stage), their mode of financing, etc.

In this study, we consider all the forms of incubators and choose the general definition of Rice and Matthews (1995) as a reference: "By definition an incubator is a business assistance program that provides entrepreneurs with appropriate advice and counsel and serves as a switching center to other people and resources, as needed. Typically, incubator programs are housed in incubator centers en which companies can

co-locate, rent space and share business services and equipment. Hence incubators comprise three components: (1) a person who provides advice/mentoring and access to a resource network, (2) shared services, which means a company located in the incubator does not have to outlay funds for a secretary, phone, fax and photocopying machine, access to the Internet…, and (3) flexible space, rented on a monthly basis, that can be expanded or contracted as needed".

Among the factors making it possible to establish a real typology of the incubators, the organisational structure emerges from the literature because it determines at the same time the host organization and its funding sources other than those brought by the incubated firms.

McKinnon and Hayhow (1998) define five categories of organisational structure: (1) economic development organizations, (2) institutions of higher education, (3) for-profit entities, (4) not-for-profit entities, and (5) public private partnerships.

In practice, however, it is scare to observe pure forms because the incubators seek to diversify their sources of revenue in order to ensure their stability and longevity. For example, the incubators hosted by universities in the USA are often financed by private funds. Moreover, university incubators generally have a technological orientation because they aim at supporting the transfers of university research to the economy, in which the projects emanate from the students, the researchers or the professors. Apart from the universities and technological parks, there are in fact few technological incubators throughout the world. Even if the non-profit incubators are most popular in Europe as well as in the USA, we notice a rise of businesses incubators supported by large firms which make use of corporate venture capital as strategic mode of R&D financing.

The success of an incubator depends on the funds which it can allocate to its business assistance program and thus of the funds that it can collect because the revenues resulting from the incubated companies were not generally enough to cover all its costs (Rice and Matthews; 1995, Campbell et al.; 1989). Moreover, public and private funds which finance this type of organization strongly vary along time. It results that a manager of an incubator shares his time between the incubator program of firms and the search for funds to finance it.

This can lead him to focus on the second task at the expense of the first and to relax the operating rules in order to increase the paid rents (by accepting companies which should not be in the incubator, or by extending the rental duration of firms which should leave the incubator).

B. The Measurement of the Incubator Performance

The literature analyzing the impact of incubators on the development of incubated companies is divided into two ways. The first approach called "normative" deals with the "best practices" of incubators (Smilor, 1987) in order to define recommendations on the improvement of their incubation process (the quality of management, the services provided to incubated firms and interactions with the external environment, etc.). It postulates a priori that incubators improve the performance of the accompanied companies.

But this type of studies is controversial because they are often strongly influenced by:

- objective: in particular when they have a goal of exemplification, or justification of the public funds allocated to incubators,

- methodology: in fact mainly case studies forget the external factors which influence the performance of incubated firms, and a lot of empirical studies use small samples.

Moreover, the recommendations made are often not easily transposable (Abetti, 2004), which limits the interest of this type of study. One second approach, called "positivist", then emerged in order to wonder about the overall process of incubation and the influence of incubators in the value creation of firms. Thus, the analysis of this relation and its determinants becomes dominating. In such a way, more and more researchers are captivated by the questionings which it brings and by the possibilities of theorization too.

The stakeholders of incubators generally estimate that incubators must influence, first, the survival of firms and employment, then, in a second time, the level of taxes collected (local and national). The last two points (employment and taxation) would ensure that if the development of incubated firms is successful, there will be a certain return on investment for public organization which finance incubators.

The academic studies on this field are far from leading to a consensus and bring to a certain criticism of incubation processes, even if official reports as those of the European Commission (EC) draw up, on the contrary, an extremely positive assessment. EC declares in particular that incubators generated 30 000 to 40 000 employment in Europe[3]. Moreover, the results of these empirical studies depend largely on the explanatory criteria of performance selected. In particular, it is necessary to be able to clearly identify the internal and external criteria explanatory of the incubator performance (Hackett and Dilts, 2004; Bergek and Norrman, 2008). The internal factors are those on which incubators can act, while they do not have any influence on the external criteria. Among the external factors, we count: the type and characteristics of the project, the human capital, and environment. For the internal criteria, we found in the literature: the experience of incubators and its managers, the selection process, the services provided, and the relational capacities of the incubator staff.

The experience of incubators does not seem to be a factor of differentiation for the second generation of incubators (created in the 90's) because they well structured their program of accompaniment contrary to the first generation of incubators (built in the 80's) which were focused primarily on material services. The diffusion of the "good practices" of accompaniment also explains this result (Geenhuizen and Soetanto, 2005).

On the one hand, the selection process has an important role because the more selective the criteria are, the more the number of incubated firms will be weak. One could then expect a higher rate of survival for these companies, but some authors like Aerts et al. (2007) have shown the opposite. The rate of survival will be higher when the practices of selection are balanced.

On the other hand, the effect is more direct and important for the resources and councils provided by incubators. They positively influence the performance of incubated companies but this influence depends on the council part of the reciprocal engagement of the two stakeholders; the managers of the incubator and the entrepreneurs (Studdard, 2004).

Lastly, the relational capacities of the incubator staff is also determining in the success of incubated firms. They avoid the insulation of entrepreneurs (Messeghem and

Sammut, 2007), and facilitate the relationship with environment. In particular, the incubator network aims at facilitating the access to the funding sources.

III. THE INCUBATOR PERFORMANCE PERCEIVED BY ENTREPRENEURS

The perception of the incubator performance depends on the provided resources and the work quality of the incubator team but it is also influenced by the personal characteristics of entrepreneurs. We will thus begin our analysis with the analysis of the impact of the diplomas on the decision to settle in an incubator as well as the impact of entrepreneurship formation on the success of a start-up. We will analyze then the determinants of this performance perceived by entrepreneurs and its impact on their decision to set up a business.

A. Assumptions and Methodology

1. Impact of Diplomas

In this section, we try to better understand the impact of the entrepreneur diplomas on their decision to settle in an incubator.

In an entrepreneurial context, the human capital theory postulates that entrepreneurs, who have more human capital (knowledge and competences in the field of entrepreneurship) will have more important chances of success in creations of activities or companies (Davidsson and Honig, 2003).

The human capital of entrepreneurs breaks up into generic human capital and specific human capital. In the literature, the generic human capital which is generally measured by the level of education itself depends on the number of years of schooling (Gimeno et al., 1997; Wiklund and Shepherd, 2008) as well as experience. According to this measurement, the more individuals have a high level of schooling, the more they would launch out in an entrepreneurial project.

In the literature, the specific human capital also refers to education and experiment which will be valid in entrepreneurial activities, but which will have few applications apart from this field (Becker, 1975; Gimeno et al., 1997). Thus, the more the entrepreneur has diploma, the more he will not need assistance. Moreover, incubators with a technological or mixed orientation are more inclined to coach entrepreneurs with diploma of higher education because of their grid of evaluation.

We therefore formulate the following three assumptions:

H1: It is more beneficial for a company to be settled in an incubator when the entrepreneur has a level of secondary studies (rather than a level of higher education).
H2: Incubators are more inclined to accompany entrepreneurs, who has diploma of higher education.
H3: It is more beneficial for entrepreneurs with a scientific or technical education to settle in an incubator.

2. Impact of Entrepreneurship Formations

In this section, we wonder about the impact of the entrepreneurship formations on the success of the projects. We apprehend the success through two variables relating to the size; the turnover and the number of employees, because many firms did not reach yet their break even point in this phase of incubation.

According to Cooper et al. (1994) and Barringer et al. (2005), education and experience of entrepreneurs contribute to reach a high growth. But, it is difficult to dissociate the two variables so much for they are closely dependent on the human capital of entrepreneurs.

However, some authors, like Davidsson and Honig (2003), showed that the most important element in terms of human capital is being the tacit knowledge acquired during a preceding experiment of start up creation.

For Rauch et al. (2005), the education and the experience of entrepreneurs positively influence the number employees of their firms.

Thus a consensus emerges from the literature. It highlights a positive relation between the experience of the entrepreneur and the success of his project, whereas the effect of the entrepreneurship formations remains unspecified. We formulate the two following assumptions thus:

H4: The start-ups, where the entrepreneur followed entrepreneurship formations, have a better economic performance.
H5: The start-ups, where the entrepreneur followed entrepreneurship formations, have a better social performance.

Lastly, the majority of the studies on the impact of entrepreneurship formation or training are focused on the intention to set up a business (Krueger et al., 2000), and not on the success of the project.

3. Quality of the Teamwork within the Incubator

All incubators provide basic services, which rest on tangible elements, like the rent of space at a moderate price as well as the access to telephone and the Internet. The real differences between incubators are thus at the level of the program of accompaniment, the delivered consulting services (in particular on the management field) and the possible contacts with potential investors.

But how are these services perceived by entrepreneurs? Do they get the same level of satisfaction than the provided material resources? Are these resources and services determining to settle in an incubator? What determines the work quality of the incubator staff?

Is the connexion with potential investors crucial for incubated companies?

All these interrogations lead us to formulate the following assumptions:

H6: The entrepreneur satisfaction, vis-à-vis the incubator in which they are established, is explained by the material resources and the services provided.

However, the role of satisfaction must be moderate because, beyond the delivered quality of service, it depends on the characteristics of the individuals as well as situation (Jones and Sasser, 1995).

H6a: It is more beneficial for a company to be established within an incubator when the material resources and the abundant services are important.
H7: The work quality of the accompaniment team constitutes a main interest of the entrepreneur vis-à-vis the incubator in which they are established.
H7a: The work quality of the accompaniment team depends on its chief.
H8: The connexion with potential investors (public or private) constitutes a main interest of the entrepreneur vis-à-vis the incubator in which they are established.

Lastly, taking into account the cost of incubators, which are generally financed by public funds, it is crucial to wonder about their impact on the performance of the incubated firms. This performance is measured by their probability of survival and the number of jobs created firstly, and by taxes collected secondly. Thus, in case of success, these companies would generate a certain return on investment for public organizations which finance incubators.

By choosing the criterion of the number of created jobs because it is easily measurable and controllable, the following assumption thus is formulated:

H9: The incubated start-ups have a higher social performance.

4. Data and Methodology

The investigation proceeded between 2003 and 2005 through a selection of incubators distributed on the whole of the French territory. Then, we questioned the entrepreneurs of these incubators, who agreed to take part in this study, either face to face, or by telephone. Finally, 404 questionnaires could be entirely validated.

This is an extract of the 80 incubators surveyed: APIS development at Villebon-Courtaboeuf, the incubator of Orsay, the incubator of Évry "Magellan", Promopôle in Saint-Quentin-en-Yvelines, Marseilles Innovation at the scientific park of Gombert Castle, the incubator "Belle de Mai" in Marseilles, CEEI in Aix-en-Provence, the incubator at the scientific park of Troyes, I2TC in Ajaccio, PACA Est incubator in Sophia-Antipolis, CICA in Sophia-Antipolis, the incubators "Pascalis" and "Pardieu" in Clermont-Ferrand, etc.

B. Results

We will firstly present the results[4] about the impact of the entrepreneur diplomas on his decision to settle his firm in an incubator, then we will analyse the impact of entrepreneurship formations and finally the results on the perceived work quality of the incubator team.

1. Impact of Diplomas

The H1 assumption, which implies that entrepreneurs having a level of secondary education (rather than a level of higher education) find more interest to be established

in an incubator, is rejected. Indeed, the proportion of entrepreneurs who have a degree or less (like self-educated people) which declare that they would have nevertheless set up a business even if their start-up didn't settle in an incubator is higher than the proportion of entrepreneurs with a diploma of higher education. In particular 77% of the holders of a degree declare that they would nevertheless have created in an unquestionable way their company against only 48% for the holders of a bachelor and 52% of the holders of PhD.

This result is not intuitive because we could anticipate that the least graduate people seek to be more helped in the first stages of their company. But this statistically significant difference ($p < 0.05$ for the Student's t-test) can be explained by the nature of the sample. 66% of the sample relates to incubators having an orientation in the technological sectors or mixed, and 83% of the surveyed entrepreneurs are graduates of higher education. For this sort of entrepreneurs, it is easier for them to integrate an incubator and important because they generally develop technological projects. This stage is crucial for the structuring of their project and the beginning of their activity (or the realization of a prototype) because this type of project requires important investments. Moreover, the incubator especially if it has a good reputation (as the technological incubator of Sophia Antipolis), will increase their capacity to raise funds.

This relationship between the ICT sector and diploma of entrepreneurs has also been highlighted by INSEE in France[5]. They found that more than 69% of entrepreneurs in the ICT sector have a diploma of higher education.

This relation is confirmed by the assumption H2. Then, incubators are more inclined to accompany start-ups when the entrepreneurs hold diploma of higher education ($p < 0.05$).

In fact, the technological orientation of the sample incubators tends to privilege, in the selection process firms managed by entrepreneurs having a diploma of higher education if it is in the same application domain than their project. Moreover, according to a study of the APCE (2006), 40% of the company founders have a level of higher education and 80% of the accompanied entrepreneurs have a level of higher education.

On the other hand, there is not more interest for entrepreneurs which have a scientific or technical training to be established in an incubator (H3 assumption is rejected). Indeed, the proportion of entrepreneurs, with a scientific or technical education, which declare that they would have nevertheless set up a business even if their start-up didn't settle in an incubator, is quite the same as the proportion of others entrepreneurs (61% versus 65%; $p > 0.05$).

2. Impact of Entrepreneurship of Entrepreneurship Formations

Our results show that the turnover carried out by firms where the entrepreneur has followed one or more entrepreneurship formations is not significantly higher than the turnover of other start-ups ($p > 0.05$). Thus, we reject the H4 assumption, and deduce that these entrepreneurs do not have a better economic performance.

In the same way, the number of employees of the companies directed by the entrepreneur who has followed one or more entrepreneurship formations is not significantly higher. We reject the H5 assumption ($p > 0.05$).

In order to better understand the impact of these formations, we carried out eight semi-directive interviews of entrepreneurs on this subject. The content analysis

consolidates the assumption that the preceding experiments of creation have an impact much more important than the formations on the success of the project. This kind of formations would be more useful to explain the intention to create specially in universities (Boissin et al., 2009).

3. Quality of the Perceived Work of the Team within the Incubator

The results emphasize that entrepreneurs 'needs are clearly targeted on the level of the functional services and the infrastructures (rent a space and meeting rooms, access to telephone and Internet, etc.).

For the other services, the results are mitigated because the projects are in the stage of structuring, and thus their needs are in constant evolution. Indeed, it is difficult to specify the services that the incubator has to provide when entrepreneurs cannot define their own needs. The results show thus that about half of the respondents are in the doubt, which will incite us to moderate our conclusions.

In general, the entrepreneur's satisfaction vis-à-vis the incubator in which they are established, is explained at the same time by the material resources and the services delivered. For the material resources, the moderate rent and the other free services or at cost price (like the access to meeting rooms, or Internet, etc) are dominating. For the services, the management councils and the assistance to contact potential investors (private or public) are the two significant variables. The ANOVA carried out is statistically significant ($p < 0.00$ for the Fisher's test) even if the variance explains is a little bit weak 28% (Adjusted R^2).

Entrepreneurs, who have a strong interest in the free services or at cost price, the assistance to contact potential investors and moderate rent, are significantly more numerous to declare than they would not have created a company if they had not integrated an incubator (H6a assumption validated, $p < 0.05$).

We can thus conclude that the access to resources and services by incubators is a determinant to set up a business for a lot of entrepreneurs. In fact, 74% of entrepreneurs came to incubation for the proposed services.

Even if the material resources are the first factor explaining the satisfaction of entrepreneurs, the work quality of the accompaniment team constitutes a main interest of an entrepreneur vis-à-vis the incubator (the H7 assumption is accepted). Moreover, this work quality primarily depends on the work quality of the chief (the H7a assumption is verified). Indeed, the appreciation of the work of the team is a function of the work of the three categories of employees; which are the director, the business program managers and the other staff ($p<0.05$). In particular, the coefficient of regression is the highest for the director (0.43), then the other employees (0.31) and finally the business program managers (0.17). The relative weak figure for business program managers can be partially explained by the fact why they are not present in all the incubators.

The importance of the connexion with potential investors with the help of incubators is confirmed through the H8 assumption which is validated. Indeed, the proportion of entrepreneurs which affirm that they would not have created their company if they had not been accompanied is significantly lower for entrepreneurs interested in connexion with potential investors: 53% of entrepreneurs say that the incubator played a big role in this type of connexion ($p < 0.05$).

Lastly, the tests show that incubated firms have a higher social performance (H9 assumption validated). This result is in conformity with the study of the APCE which indicates hat the median number of employees by company in the early stage is about 0.55 in 2002. The average observed on our sample for incubated companies is about 1.05.

IV. CONCLUSION

Our empirical approach made it possible to clarify a certain number of conclusions concerning French incubators:

* Graduates (having more than one degree) are more likely to seek help in the first developmental stages of their company. But this result has to be moderated because it depends on the nature of the projects developed. Indeed, 66% of the incubators which we questioned have a technological or mixed orientation. It is thus normal that they attract graduates of higher education,

* The nature of the diploma (technical or technological versus others) does not have any importance. This result has to be moderated because the management team of incubated firms is generally larger and more diversified than in other firms,

* Entrepreneurship education does not have any impact on the turnover, nor on the number of employees of the companies whose entrepreneur followed this type of program. The specificity of our samples, which represents only one category of entrepreneurs,

* Needs of entrepreneurs vis à vis incubators are clearly targeted on functional services and infrastructures. For services, the councils on general management of their firm and the assistance with obtaining capital (private or public) are two crucial needs for entrepreneurs and have a strong impact on their incubator satisfaction,

* The access to resources and services through an incubator are determinant for entrepreneurs in the action of creation,

* The work quality of the incubator team constitutes a main interest of entrepreneurs vis à vis an incubator. Moreover, the entrepreneur's satisfaction of the work provided by the whole of the incubator team is primarily a function of its director. This result is due to the fact that in the majority of the surveyed incubators, there is no business program manager and the director also assumes this function,

* The incubated firms have a higher social performance.

Finally, these results show the social utility of incubators in France. Indeed, they encourage entrepreneurs to pass to the act of creation, also contributing to the success of the incubated firms. Moreover, these companies create more jobs than the other start-ups. However, the services provided by incubators could be more developed and focus more on the assistance in the search for potential investors. For those entrepreneurs questioned, it is a field in which the incubators must progress.

Lastly, the work quality of the incubators perceived by entrepreneurs is largely dependent on their directors. This fact can explain important variations of performance between incubators.

ENDNOTES

1. The first incubators were born in the USA, for certain authors in the Thirties, for others, the first incubator would have been created in Batavia (State of New York) in 1959. Dinah Adkins "a brief history of business incubation in the USA".
2. We will employ usually the term of "accompaniment" (or coaching) to make reference to a business assistance program in incubators.
3. «Final Report: Benchmarking of Business Incubators», Centre for Strategy and Evaluation Services (Eds.), 2002.
4. More details, results and tables are available from authors on request.
5. http://www.insee.fr/fr/themes/detail.asp?ref_id=ir-sine2009&page=irweb/sine2009/dd/sine2009_regio_profil.htm#SINE2009_REGIO_PROFIL_ACTIV

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