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THE MACRO AND MICRO CONTEXT OF BUSINESS INCUBATORS: A PRELIMINARY APPROACH TO INCUBATION PROCESSES

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ABSTRACT

This communication is intended to provide a theoretical contribution to help our understanding of the context of business incubators from a systemic and interactive perspective. The goal is to describe the different incubation processes from both the macro point of view of their involvement and relevance in relation to the competitive global economy, and the micro point of view, which concerns the many interactions established within their transactional scope. Two focal points for the context of incubators thus emerge: the macro context of positioning and relations at the level of the overall environment, and the micro context of interactions at the level of a specific transactional environment.

INTRODUCTION

It is acknowledged today that a nation's standard of living depends on the development of science and technology. The considerable progress achieved worldwide with the new micro-electronic and computer technologies, for instance, has enabled advances to be made in all spheres of human activity, at social, economic and, especially, entrepreneurial levels. The high rate of technological change imposed by competition between industries at international level has forced most firms to focus their attention on technological aspects as productivity-enhancing factors. This competitive dynamic has thus been driven and characterized by its speed and widespread innovation.

The capacity of companies to innovate and develop is thus broadly recognized as the fundamental driving force leading to increased profitability and improved living standards. The smaller innovating firms, including new, technology-based ones, are important players in this process, since they accelerate structural change and create new jobs to replace those lost through the decline of old industries and the lessening importance of large companies.

Countless public measures have therefore been adopted under the science and technology policies of the OECD countries with the aim of creating the right conditions for new, innovating companies to emerge. This is where incubators have arisen as important tools for regional economic strategies, and, more recently, as a result of innovation and technology policies. (OECD, 1992; 1993; 1994; 2000)

The main reasons for the appearance and growth of business incubators can be found first in the widely observed flaws in the market and systemic dysfunctions that restrict the ability of small innovating firms to survive during the early stages of their lives, and prevent entrepreneurs from overcoming the uncertainty and obstacles associated with starting up an activity. Secondly, there is the fact that the incubator assumes the role of catalyst relative to the commercialization of research outputs and technological development, providing all kinds of assistance to entrepreneurs. (OECD, 1997; Kalis, 2001)

This paper describes the various processes associated with business incubators, both from the macro perspective of their environment and relevance with respect to a nation's economy, and from the micro standpoint of the multiple interactions established under their transactional environment.

Section 1 is thus introductory in nature. It defines what a "business incubator" is, its significance, and the sundry concepts found in the literature and in practice to express the core objectives of incubating innovative ventures.

Section 2 gives an overview of the background to business incubators, characterized as a macro environment context. The third section narrows the focus of the analysis, giving the micro environment context, identifying a model explaining the transactional environment, proposing a classification for incubators on the basis of their aims, and describing the links between the essential actors in a basic transactional environment.

Section 4 contains a concluding summary of the contextual position of incubators via an interactive systemic view in which the two perspectives of the incubator's environment are reconciled.

In the conclusions, we have outlined the main features related to the importance of this kind of science and technology policy tool, for companies and for countries. We have also underscored the central idea of creating conditions to nurture and develop entrepreneurial initiatives that are based on science and technology and are likely to be innovative.

1- BUSINESS INCUBATORS: THE CONCEPTUAL FRAMEWORK

The term "incubator" signifies a controlled environment to support life. Farmers use incubators to maintain a heated environment to incubate fertilized eggs. Maternity units keep premature infants in incubators for the first, critical, days of life. In the context of business development, incubators are used to help the transformation from potential entrepreneur to fully-fledged, profitable enterprise. By reducing the risks during the initial period of setting up a company, incubators help its development and economic growth, and encourage regional revitalization by promoting new firms and jobs (Lalkaka and Bishop, 1997).

While there is a considerable difference from country to country, and from region to region, the concept and reality of a business incubator is usually concerned with providing low-cost operating and funding conditions for the planning and development of new businesses. We would thus draw attention to the definition put forward by the OECD (1997, p. 13), which sees the business incubator as a concept that "refers to the practice of providing low-cost, property-based facilities and shared services to nurture the development of new firms". A similar line of thought is followed by the National Business Incubation Association (NBIA, 1997, P. 1) which stresses the same ideas defining business incubators "which provide comprehensive support to companies in their start-up stages, help entrepreneurs achieve their dreams, and help communities develop more vibrant economies".

Both definitions imply the incubator concept as a tool for technological development that aims to accelerate the growth and success of entrepreneurial firms via a series of services and support resources. Another important goal of a business incubator is to produce a successful firm, which, once it leaves the incubation programme, will be financially viable, independent and able to survive in the face of strong competition.

With regard to this, we should mention that the specialized literature (OECD, 1997; NBIA, 1997 and 1998, Macdonald and Joseph, 2001; CSES, 2002) often use other terms for incubators, such as, "Technology Incubator" (TI), "Technology Innovation Center" (TIC), "Technology Business Incubator" (TBI) and "Business Innovation Centre" (BIC), which bear a strong resemblance to the concept of Business Incubator. The features of these other concepts are given below:

- Technology Incubator (TI): is mainly concerned with assisting the technological development phase. It aims to finish off technological ideas or technologies that have potential, but are only partly developed. The specific activities it undertakes include providing specialist advice for technological guidance, the joint development of projects, support in obtaining the necessary financial backing, and help in using related experimental/instrumental machinery and equipment and computers. In some cases, the TI may provide other assistance, such as office space and telecommunications equipment;
- Technology Innovation Center (TIC): the TIC develops the R&D and technological innovation required by the industrial area to which it belongs, and which, as a group, wishes to invest resources in universities or research institutions, and to commercialize the outputs with the aid of public companies or institutions (Kalis, 2001). As a concept, the TIC is similar to a technology part, but in the R&D phase it is more like the TI;
- Technology Business Incubator (TBI): the TBI is an initiative promoted by universities, public research institutes, local governments or private institutions whose aim is to encourage and support a new high technology enterprise. The TBI differs from the TI and TIC in that it helps to commercialize previously developed technology, that is to say, the initial activities of an enterprise. It differs from the generality of business incubators in that it is concerned with high technology businesses;
- Business Innovation Centre (BIC): is an organization that provides infrastructures to enable enterprises to get established and grow. Its goals include the regional development of

innovation, cooperation between researchers and industry, technical training and management, regional economic development, and establishing enterprise cooperation networks.

Despite these differences, and the various kinds of incubators, this paper will adopt the above definitions proposed by the OECD and NBIA, since they are general and inclusive, which chimes with our goal of making a contextual analysis of business incubators.

2- THE MACRO CONTEXT OF INCUBATORS: THE OVERALL ENVIRONMENT

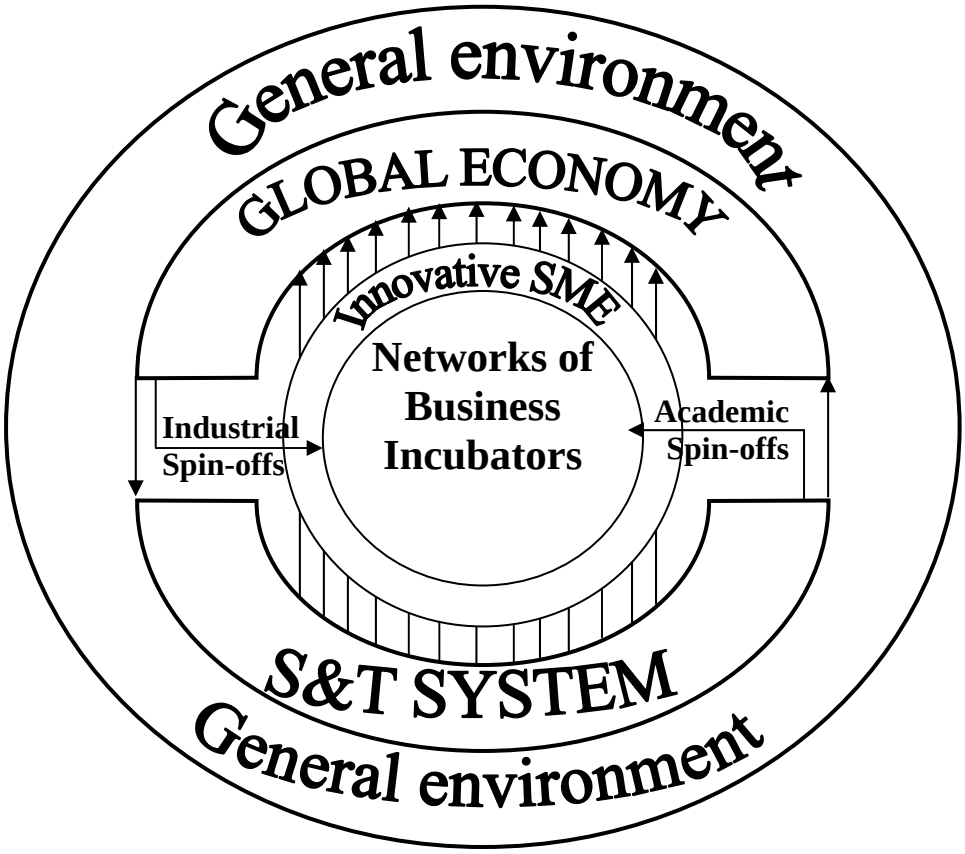
Given that innovation is the force that drives social and economic development, which is itself the key to prosperity, the innovating dynamic cannot happen unless there is constant renovation of the technological base. This desideratum is a challenge encountered by all the developed industrialized countries, which contend with fundamental changes in their industrial structures, and with growing unemployment.

Managing innovation as a guiding economic factor thus means a faster conversion of the latest research discoveries into marketable technological products and innovating services, an objective that is closely linked with support for small- and medium-sized innovating enterprises.

In this context, various centres have been established in many countries, to aid innovation. They have names like technological centres, science and technology parks, “technopolis”, business innovation centres (BICs) and business incubators (OECD, 1997; CSES, 2002). A fundamental point about this support is the assistance given to predominantly technology-based enterprises, and in this case the business and technology incubators play a crucial role, becoming economic factors whilst being support infrastructures.

As connection points in a broad network of innovation, incubators first emerged via regional initiatives, with “public-private partnerships” being obvious examples (OECD, 1997; 2000). This innovative environment could, from the point of view of the contextual framework, lead to an analysis of business incubators relative to the macro perspective, in which they act as infrastructures and general mechanisms for transferring knowledge/technology from the wider scientific and technological system to the productive and service sector, which is the global economy. From this standpoint, business start-ups in general, university spin-offs and industrial spin-offs all play an important role around which the incubation processes are organized and to which scientific and/or technological knowledge is transferred. Figure 1 illustrates this, showing the position of incubators at the heart of the overall macro environment.

Figure 1: The Macro-context accommodating business incubators



Source: Adapted from Gross (1997)

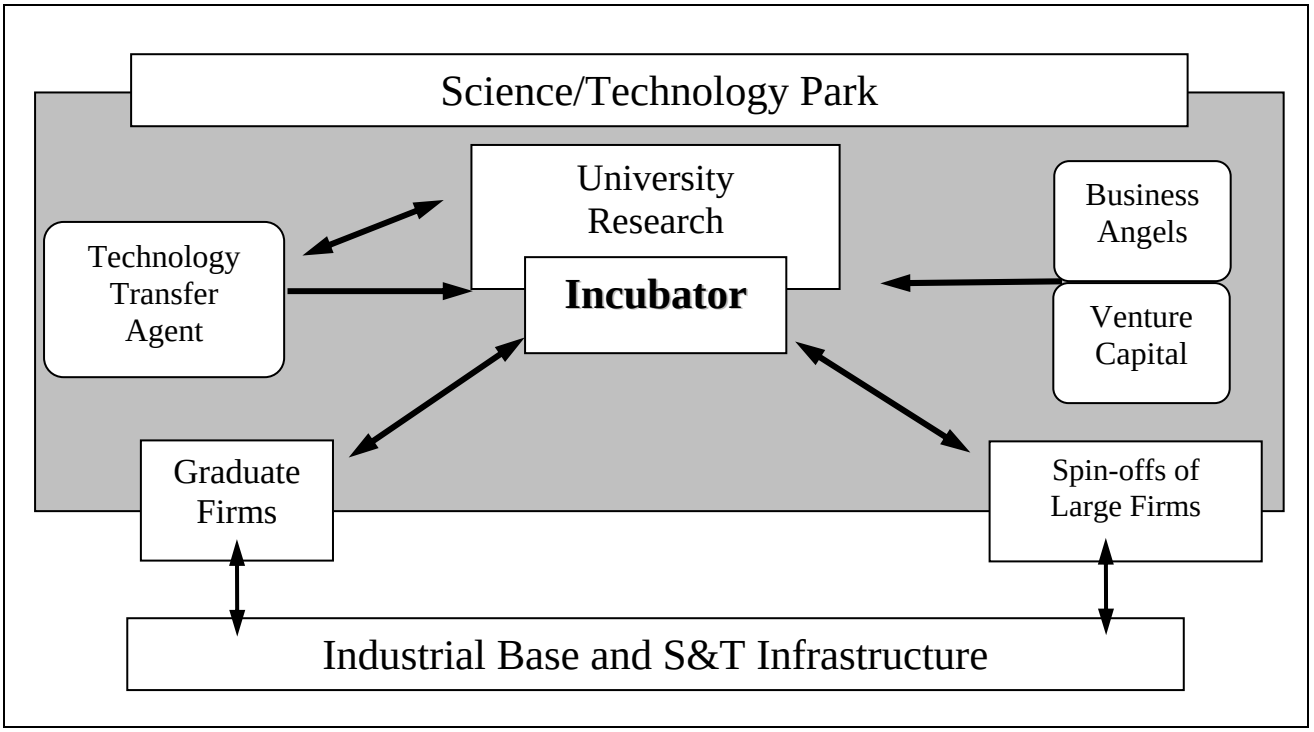
3- THE MICRO-CONTEXT OF INCUBATORS: THE TRANSACTIONAL ENVIRONMENT

3.1 – A model explaining the transactional environment

Among the major goals of business incubators, their ultimate goals, in fact, we would emphasise the four mentioned by the OECD (1997): 1. economic development; 2. commercialisation of technology; 3. development of property assets, and, 4. Entrepreneurship. The immediate goals of interest to the parties are the temporary availability for use and sharing of premises and land, a variety of equipment, and administrative, commercial and technical services, as well as providing access to sources of funding, including venture capital and networks of 'business angels'.

Incubators thus involve a wide range of directly interested actors, who converge in a context that may be termed transactional. Conspicuous among them are the traditional financers and stakeholders, including central governments, local authorities, regional development agencies, universities, science parks and not-for-profit organisations. Figure 2 shows a model of the micro-context for an incubator as proposed by the OECD, in which we can see the interested parties – stakeholders – and the network of relations and interactions generated among them.

Figure 2 – A model illustrating the Micro-context of a Business Incubator



Source: Adapted from the OECD (1997)

Private capitalist not-for-profit economic agents may also finance business incubators, and they do so largely in terms of land and premises. Facilitating relatively low rents and sharing services help to reduce operating costs. Furthermore, incubators help management, flexibilising the use of spaces which may be rented monthly or yearly. Such a flexible system of coming and going is, according to the OECD (1997), a fundamental characteristic of business incubators.

3.2 – Classifying incubators according to their goals

As mentioned earlier, the definition, typology and technology focus of business incubators varies considerably from country to country, and even within each country. Investors and financers of incubators determine their goals to quite a large extent, which explains this diversity. For instance, local economic development agencies, like Chambers of Trade and Industry and Industrial Associations, generally try to stimulate economic growth and employment, while universities want to promote the transfer and diffusion of knowledge and/or technology. The OECD (1997) has described a classification of business incubators in terms of their principal goal as well as the features of tenant enterprises. The 3 main categories of business incubators are:

1. Technology incubators: whose main goal is to foster the development of technology-based firms. These are mostly found in Universities, or close to them, or in the vicinity of science parks and technology parks. They are characterised by the establishment of a series of institutional links with sources of knowledge, including universities, technology transfer agencies, research centres, national research laboratories and skilled researchers. Equally important are the goals that tend to encourage the spread of technology, while simultaneously stimulating

entrepreneurial initiative among researchers and academics (as in the case of spin-offs). In some countries, technology incubators are not just centred in new firms, but they also help existing technology-based small businesses, including subsidiaries of already-established large groups;

2. Economic development incubators: whose main mission is to stimulate specific economic goals, such as job creation and industrial reconstruction. These frequently result from local government initiatives whose chief aim is to help set up new businesses and to contribute to the growth of those already established, which are providing jobs. In many countries this aim may target specific groups, such as the young, or long-term unemployed, women and minority groups. In the USA, for example, empowerment/micro-enterprises have been set up (OECD, 1997);

3. Mixed purpose incubators: whose chief aim is to promote the continued industrial and economic growth of a region via the general nurturing of businesses. While these incubators incorporate firms based on intensive knowledge they also include enterprises whose technology is traditional, outmoded, which are concerned with small-scale services and production. One of the main ways they help is by offering access to local and regional sources of technical, management and marketing resources, and funds.

3.3 – The basic transactional environment of the incubator: the essential actors

Focusing this study on incubators in general, business incubators, we can agree with the OECD (1997) and Lalkaka (2001) that there is no single model of business incubator, far less a single definition. In most cases a business incubator is an intiative based on scientific or technical knowledge and associated with a university, a science or technology park, or with an innovation centre. In some countries, the incubator is an integral part of a science park (as in the United Kingdom), or of an innovation centre or technology centre (Germany), or it may be a separateunit that operates within a large infrastructure based on the knowledge of a university, technology or science park (as in the USA, France and Japan). In Portugal, incubators have mostly emerged heterogeneously, driven by a university, a science and technology park, and also by industrial associations.

From the transactional point of view, however, there are three components essential to any incubator: 1- an operator or promoting body; 2- investors/financers; 3- enterprises based in it (Lee 1997).

An incubator's promoters/operators, also known as host entities, are usually:

1. Universities: without exception, these play a crucial role as sources and repositories of scientific and technical knowledge, as well as being vehicles both for transmitting it and for generating new entrepreneurs;

2. Business Innovation Centres (BIC): organisations that provide infrastructures to enable firms to set up and grow;

3. Science Parks: these operators can be characterised as a complex of organisations and activities within a restricted geographical area close to a university campus, where diverse interests and strengths converge, particularly those related to science and technology, industry, sources of capital/finance, and entrepreneurial initiative.

4. Technology Parks: which are also known as technopolises, tend to be on a larger scale than science parks. They constitute a zone of economic activity which includes universities, research centres, industrial and service units, which operate on the basis of research and technological development. Technology parks occupy a limited geographical area, but they maintain links with large companies and public research infrastructures, both nationally and

internationally. In Japan and France, the technopolis model covers the whole surrounding area, while in the USA they differ in that their main goal is to promote synergy among nearby industrial research sectors and to create specific "centres of competence" (Coudivat and Giusti, 1991).

These operating entities, or hosts, lead to practical operations and activities such as the selection, incubation and graduation of firms based there, with financial support from investors. At the same time, the operators should provide a number of basic conditions, such as administrative and technological guidelines and financial plans for tenant firms, receiving in exchange rents from hiring out premises, and consultancy fees (Lee, 1997). Universities, research institutes or government bodies very often take on the responsibility for the operating entities, because of their non-profit making status.

In general, the manager of the incubator shoulders all the responsbilities and obligations, as finding it essential to appoint an individual respected by the government and the banks, not to mention the science and technology institutions. The manager of an incubator should have considerable personal and administrative skills to be able to motivate, communicate and energise young entrepreneurs with new ideas, understanding everything about the process, from the initiation of the activity to the full running of SMEs.

The second actor involved in the process of incubation is the investor and financer, considered by Lee (1997) to be the player essential to the starting up of an incubator.

The specialist literature gives as examples of investor entities, venture capital enterprises, large companies that are already established, and private, informal investors with an interest in technology (Business Angels) (OECD, 1997; Krafft and Klandt, 2001), banks and other financial institutions ("Anchor leaseholders") (Lalkaka and Bishop, 1997).

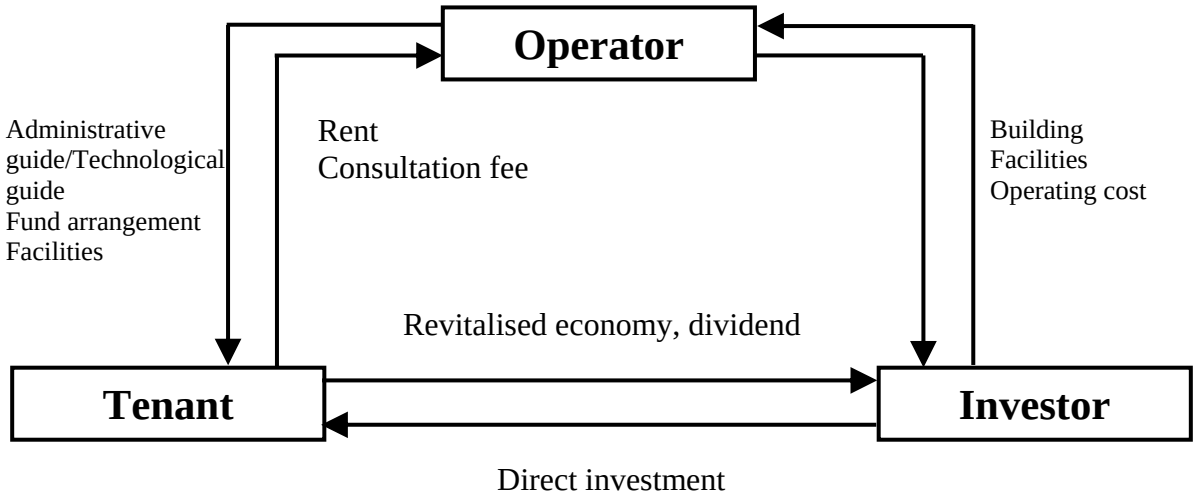
It is this entity that provides the operator with the funds to build/rent the premises or facility, acquire whatever equipment is needed and finance operations, while commercial investors may sometimes invest directly in a tenant firm that looks promising. Whereas public investors normally benefit from a broadening of the national economic base, which helps to revitalise the economy and create jobs, private investors have rights of ownership over promising firms, and they may later enjoy dividends when the firm is eventually listed on the stock exchange and the value of the shares rises (Lee, 1997).

The third actor is composed of tenant enterprises within the space of the incubator. These should be innovative start-ups and technology-intense micro-businesses and SMEs that form part of the high-tech industry sector, such as electronics, computers, information and communications, software, genetic engineering and precision machinery.

Admission is usually confined to firms that are likely to contribute to the development of technology and the national economy, and that have good potential and high technological capacity, especially in terms of ability to make the most of the conditions and facilities offered. For its part, the tenant enterprise must pay rent for the premises and fees for using and consulting the operator, and has to share the profits in those cases where the investor has a stake in the enterprise's capital.

Figure 3 summarises the above ideas, giving a scheme of the actors involved at the heart of the incubator.

Figure 3 – General scheme showing the interactions of the actors essential to a Business Incubator



Source: Adapted from Lee (1997).

4- THE CONTEXTUAL POSITIONING OF INCUBATORS AND THEIR INTERACTIVE PROCESSES

In the light of the above sections, it may be seen that there is no unique model for a business incubator. The incubation of new enterprises is a highly flexible process, with sundry stakeholders pursuing different goals.

Any attempt to explain the multiple relations between the stakeholders involved with incubators must bear in mind the incubation process, in all its details. Rubio (2001) has suggested a systemic model of the incubation process for innovative enterprises, which explicitly stresses the position of the incubator in overall macro environment, where the existence and activity of the incubator is implicit in the confluence of the two contextual environments described, with the participation of the three essential actors mentioned above – the promoter, financer and tenant enterprises.

Rubio describes a configuration of the incubation process based on three phases: Pre-incubation; Incubation, and Dis-incubation. Figure 4 illustrates the network of relations and interactions established under this model. The Pre-incubation phase, according to this model, aims to transform innovative ideas or projects, whether from the academic community or the business community, and the entire surrounding environment, into a business with market potential. This phase is based in laboratory work and university research groups who can offer their physical and technological infrastructures, as well as intellectual skills. Pre-incubation is thus seen as a preparatory phase of incubation, where all aspects of the future business are planned, namely, strategy, technology, finance and marketing, thereby also contributing to the development of an entrepreneurial culture in the universities.

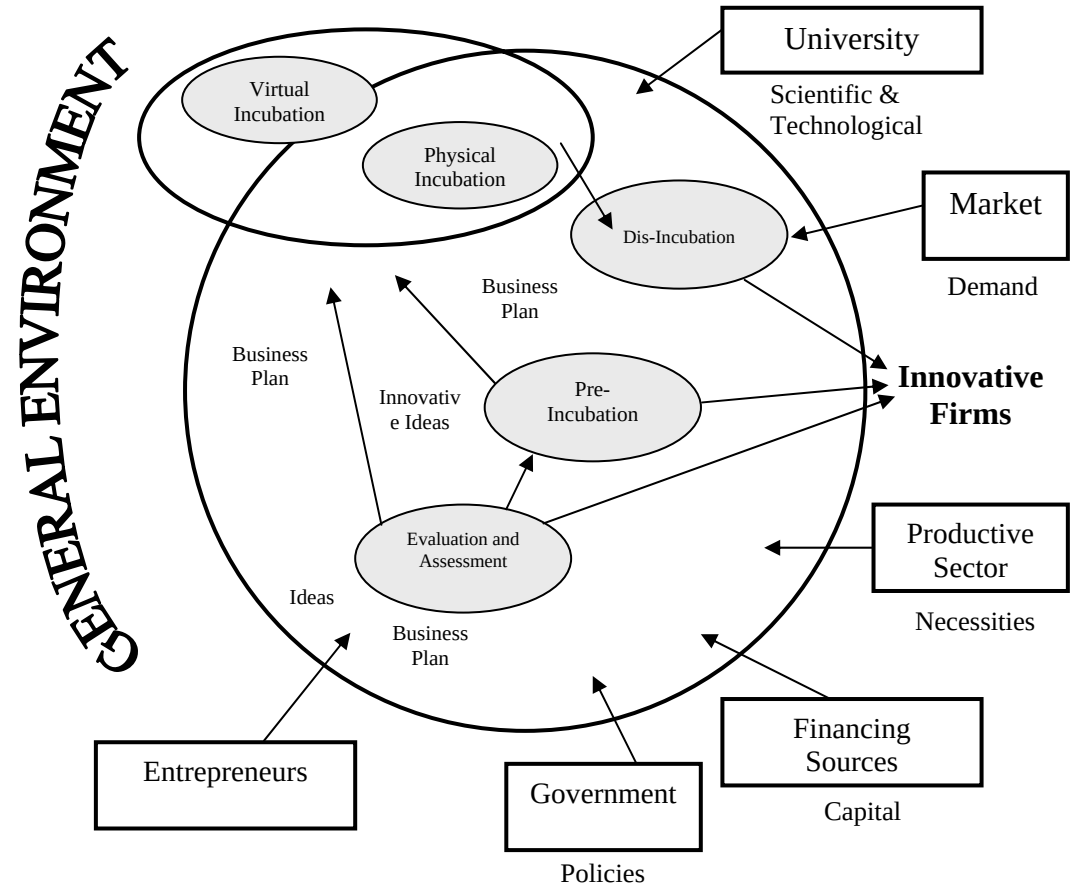
In fact, it gives entrepreneurs a general guide to the features and process of incubation via forums, conferences and discussions open to the general public. Access to the knowledge needed to draw up a business plan for the project is thus facilitated, and the technological support required to develop a prototype is made available. Furthermore, consultancy services in the areas of management, finance, strategic planning and legal aspects related to the setting up of companies, intellectual and industrial property and patents is also on hand. This phase,

lasting no more than one year, makes it possible for the entrepreneur to leave the incubator or move on to one of the incubation modes: virtual or physical, depending on the assessment of the incubator's managers.

The second stage is the Incubation itself. Here, the entrepreneur is provided with the physical infrastructure needed once the contract to rent premises has been signed, and the strategic and management services to help it develop its activities have been organised. These take the form of various services, including: flexible spaces, meeting and reception rooms, cleaning services, telephone and internet communications. Technical services embrace easy access to R&D support services from the university, and consultancy services, permanent technical back-up and the training of entrepreneurs. Strategic services include access to information on sources of funding, help in dealing with banks and organising training, and in making agreements with other firms, institutional co-operation, etc., plus a range of other optional services. The virtual incubation mode offers all the above services, except for space rental and cleaning, telephone, electricity and internet services.

The third stage, termed Dis-incubation or graduation, begins when the enterprise completes the actual incubation phase, and its purpose is to help the young company to set itself up outside the incubator. Firms can still take advantage of the services, however, if they pay proper market prices, and they mostly benefit from the monitoring of their activity in the new, unprotected environment of the globalised competitive market.

Figure 4: A systemic model of the Incubation process.



Source: Adapted from Rubio (2001)

This model, starting from the premise that the enterprises to be incubated are innovative initiatives, based on scientific and technological knowledge with potential to generate added value and create jobs for skilled workers, has also been examined by Kalis (2001), who focused particularly on the potential for commercialising technology, making it possible to see the interaction between the incubator's stakeholders so as to create a dynamic of co-operation that could have a positive impact on the development of the university, and on business, and, therefore, on the economy as a whole.

Once again, the different links and interactions among the protagonists, which illustrate the systemic and flexible nature of the process, are stressed. The main entry point into the system overwhelmingly corresponds to the potential customers of the incubator, be they young people with entrepreneurial ideas, university teachers with prototypes or projects, firms that are trying to diversify via innovating in terms of goods, processes, services or new business oportunities, or even firms that want to sponsor new enterprises. These are all key entities, without which incubators would not exist, and no incubation process would ever function.

CONCLUSION

This analysis has described business incubators, in all their breadth and with all their implications, both from the standpoint of the macro context of their positioning and relations at nation level, and from the micro context of the transactional environment in which the various stakeholders interact.

We have thus seen that the literature referenced justifies the existence of business incubators as important tools of countries' science and technology policies, as means of generating jobs and wealth, thereby enabling governments to show their ability to solve problems of economic development and employment. Moreover, the description of the transactional, micro context results from the fact that business incubators are not isolated businesses, but they tend to be linked, one way or another, to public and private sources of scientific and/or technological knowledge. Such sources include universities, R&D institutions (public and private), and technology-based firms, as well as sources of funding.

Small, technology-based enterprises that wish to start and activity (start-ups) and spin-off companies originating in universities and industry, benefit hugely from the support of incubators, since they are supplied with a range of conditions to help them survive the first stages of their operations, giving entrepreneurs the chance to get over the uncertainties and problems associated with embarking on an activity.

Finally, attention is drawn to an interactive systemic model of the incubation process, introduced in accordance with its actual nature in the convergence of the wider, overall macro environment and micro environment. It features the stages of pre-incubation, incubation and dis-incubation as crucial phases in the successful nurturing and development of entreprenurial initiatives that are innovative in character.

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