

Technology Incubator: A New Way for Creating Technology Based Economy

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Introduction

The emergence of new technologies and the increasing globalization of R and D and investment have significantly changed the nature and scope of industrial competitiveness. Countries are moving further into knowledge-based economic development, of which technological venturing is a key factor for international comparative advantage in industry. Knowledge and technological capabilities are becoming increasingly crucial for national development in order for countries to respond effectively to emerging challenges and opportunities.

Strengthening and promoting technology ventures through incubation programs for new technology-based enterprises is necessary for them to survive in a competitive society. Technology venturing through incubator activities is an important tool for the commercialization of R and D outputs and the transfer of technology. Compared to the old “big is beautiful” industrial order, the new thinking sees “small” and “entrepreneurial” as better, especially in terms of contribution to technological innovation, economic growth, employment and social equity.

Since the 1980s, technology incubators have become an important focus of technology and innovation policies in North America, Europe and, more recently, Japan, largely due to the growing importance of small and medium-sized enterprises (SMEs). At the aggregate level, **small technology-based firms** are significant creators of employment, facilitate structural change and stimulate economic growth. About 93per cent of high -technology firms in the United States have less than 500employees and 70per ce nt have less than 20employees . In 1991, small high technology companies (those with less than 500employees) provided 25per cent of the jobs in high-technology industries (US, SBA, 1997). Not all new technology-based firms are large creators of jobs, with such firms in the United States showing higher rates of job creation than similar firms in Europe (European Commission, 1996). While the reasons for different rates of performance may vary (e.g. access to capital, university links, competence centres), it is widely acknowledged that the creation and growth of technology-based firms can be inhibited by lack of finance, management skills, technology and access to markets.

First business incubator established in USA in 1959. Nowadays there are over 4000 busi ness incubator in operation throughout world. From a handful of facilities (40) identified by the National Business Incubation Association (NBIA) in its 1984 Quarterly Roster of incubator, there are now 800 members in the US alone . There are also hundreds of the newer 'for profit' incubator set up either as standalone ventures or consortia led by major accountancy practice, management consultancies, venture capital providers or major firms that dominate the high-tech world.

Definition

Incubator defined as:

Incubator (noun) apparatus providing warmth for hatching eggs, rearing premature babies, or developing bacteria.

Oxford Dictionary, Oxford University Press

An environment and program with certain important characteristics: it offers a full array of business assistance services tailored to the client companies; it has an incubator manager on site who co-ordinates staff and outside professionals and organizations to deliver those services; it graduates companies out of the program (through not always out of the incubator facility) once they meet the program goals.

The National Business Incubation Association (NBIA), Athens, Ohio

Technology incubators are a specific type of business incubator: property-based ventures which provide a range of services to entrepreneurs and start-ups.

Despite its brevity, the Oxford dictionary definition of an incubator captures rather more of the essence of the subject than that provided by the organization that has set itself up as the premier 'trade association' for those in the incubator business. However, neither definition gives the full picture of the array of services, motivation and facilities provided by business incubators.

Objectives of business and technology incubators

Technology incubators have four main objectives: 1) economic development; 2) technology commercialization; 3) property venture/real estate development; and 4) entrepreneurship. Job creation is a main underlying purpose of incubator support for new business formation, especially of technology-based firms. Incubators can also play an important role in strengthening co-operation between public and private actors in regional economic development. They have an outreach role, fostering entrepreneurship and training in the local community. Moreover, incubators have a *symbolic* role in that they allow governments to demonstrate their efforts to address problems of regional development and unemployment.

Economic development

Incubators are a tool for promoting new businesses, especially technology-based firms. A main underlying goal of support for new business formation is job creation. The Georgia *Advanced Technology Development Centre* (ATDC), created in the United States in 1980 emerged as a part of a state policy to diversify the industrial base to new technology sectors in the face of foreign competition. Technology and business incubators, as in Germany, also play an important role in strengthening co-operation between regional public and private actors in regional development. Incubators also have a *symbolic* goal in that they allow governments to show a visible example of their efforts to address regional development and employment concerns. This is important at a time when governments can no longer afford to provide costly support to large declining industries and when globalization has rendered such direct supports largely ineffective.

Beyond general economic development, incubators are a tool for addressing *specific* or unique economic challenges. In Japan, regional development policies in support of incubators and related initiatives are driven by a desire to increase the concentration of knowledge and industry around the major metropolitan areas. In Israel, technology incubators were developed as an instrument to help integrate highly qualified immigrants from the former Soviet Union. In Germany, the ADT network of technology and business incubation centres quickly became a tool for promoting a new way of doing business in the eastern *Länder* and as a means of helping the reunification process. Finally, incubators play a role in infrastructure building, both in physical and immaterial terms. In Italy, the BICs have targeted areas without spontaneous clusters and where the lack of infrastructure impedes the growth of small firms.

Technology commercialization

In the context of university-based incubators, there is a perception that most universities have technology which needs to be commercialized and that universities, with help from industry, can accomplish this. On the one hand, university research results are rarely immediately commercially viable while the short-term demands of industry may comprise longer term goals of university research. Universities may also prefer, for both economic and technological reasons, to work with larger industrial firms rather than SMEs. For firms, proximity to industrial R&D is often more important than university linkages. Studies of firms located in UK science parks have found only marginal impacts on turnover and job performance when compared to similar firms located outside the park. Surveys of firms in technology incubators suggest what is most important is not access to university research but increased credibility, prestige, access to a pool of highly qualified university

graduates, access to databases and libraries and greater creditworthiness in the eyes of investors and banks.

Approximately half of the estimated 4 000 firms that have emerged from German technology and business incubation centres since 1990 to 1996 are university -spin-offs. Besides the commercialization of research results the German example showed that a main goal of technology incubators is the diffusion of know-how to SMEs, not only from universities but also from applied research centres.

Property venture/real estate development

Technology and business incubators are also lucrative property-based ventures. The example of the *Italian Business Innovation Centres (BICs)* illustrated the importance of this on the supply side. On the demand side, firms may also wish to relocate in incubators because of the tangible and intangible benefits involved.

Entrepreneurship

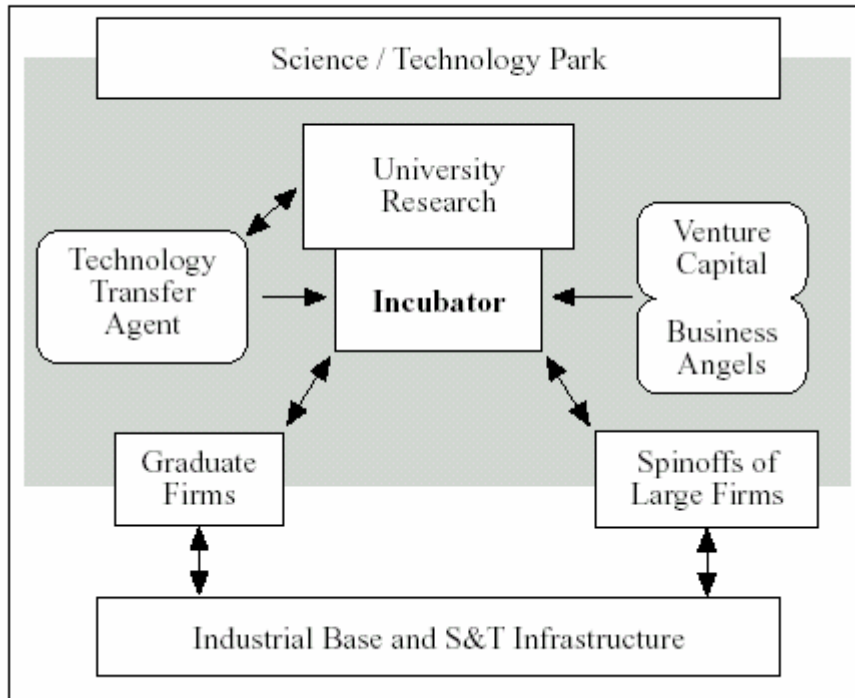
Promoting entrepreneurship through incubators is another objective of public support. Entrepreneurship is increasingly recognized as a critical element in the process of innovation and the creation of technology-based firms. Entrepreneurs, however, are not a homogenous group nor are the founders of technology-based firms necessarily individuals with advanced science degrees. There is, however, evidence that the proportion of founders with science PhDs has increased in recent years.

Incubators, in particular those located in universities, can act as a laboratory for commercializing the ideas of academics and provide a “training ground” for entrepreneurs. Incubators often have an outreach role, fostering training in areas such as information technology skills in the local labor market. Finally, through the building of networks with surrounding formal and informal investors, incubators can help strengthen the link between capital and entrepreneurs.

It is recognized that entrepreneurs face numerous challenges in starting a business, including substantial entry costs, high-fixed costs, lack of access to equity capital, insufficient technical and market information, and weak management skills. The start-up phase of a small business is associated with considerable uncertainty, and new businesses often have cash flow problems during this period. Support for business incubators is also provided on the basis of (regional) economic development objectives: stimulating job creation and industrial restructuring.

Figure 1 presents a schematic presentation of technology incubation as a vehicle for linking technology, entrepreneurs, small and large firms and sources of capital.

Figure 1. Technology incubation



Rationale for public support

A main justification for public support to business incubators is based on **market failure** which results in disincentives to firm creation. Entrepreneurs face significant obstacles to starting a business, e.g. high -fixed and entry costs, lack of access to equity capital, insufficient technical and market information, and weak management skills. The start-up phase of a small business is associated with considerable uncertainty and new businesses often have cash flow problems during this period. The existence of bottlenecks in the post start-up phase, in particular later-stage financing, weak management and marketing have been associated with the very high failure rate of new firms, another justification for nurturing new firms in incubators. Support for business incubators is also provided on the basis of (regional) economic development objectives: stimulating job creation and industrial restructuring. More recently, business incubators are supported as part of socio-economic policies to help under-represented groups in business development (e.g. youth, women, minority groups).

In the case of **technology incubators**, support may be justified on the basis that market or systemic failures impede the commercialization and diffusion of technology by new firms. The greater uncertainty associated with technology increases the risks inherent to new business start-ups; incubator services help reduce this uncertainty, thereby increasing the chances for survival. On balance, evidence on survival rates of technology-based firms suggest such firms are in fact a lower risk, but the problem may be one of *perception* among investors and reflect different levels of experience in assessing risky projects (European Commission, 1996). Technology incubators are also supported as a means of increasing returns from public R&D spending by promoting its commercialization and diffusion.

Incubator services

Technology incubators provide a range of services to entrepreneurs and start-ups including physical infrastructure (office space, laboratories), management support (business planning, training, marketing), technical support (researchers, data bases), access to financing (venture capital funds, business angel networks), legal assistance (licensing, intellectual property) and networking (with other incubators and government services). Business incubators don't provide specific technical supports. Figure 2 presents the technology incubator services.

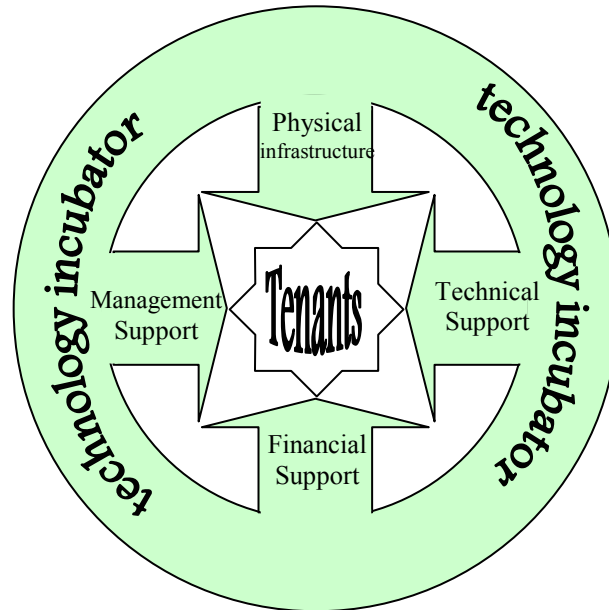


Figure 2 technology incubators enable service

ADVANTAGES OF THE INCUNATOR CONCEPT

Using (technology) business incubators have advantages for incubator tenants, tenants employees, incubator investor and community where incubator is located:

Advantages to Tenants

- Employee training
- Initial minimal capital outlay
- Credibility
- Shorter learning curve
- Problems solved faster
- Resource library
- Business networking
- Financing
- Physical facilities
- Shared services
- Below-market rental rates
- Flexible leases

Advantages to tenant employees

- Use of shared office equipment (fax machine, copier machine, computer, Internet)
- Use of lunch/break room facilities
- Telephone coverage support
- Receptionist/secretarial assistance/support

- Opportunity to watch a small business grow/develop (see it built from the bottom up)
- Opportunity to interact with a wide variety of businesses/people
- Accessibility to shared goods/services with other tenants
- Parking
- Not having to perform janitorial/maintenance services
- Working with personable support personnel who care about the success of each company and its employees
- Location (including near proximity of major shipping company)
- Warm and friendly atmosphere/climate
- Networking with other businesses
- Seeing decision made at the ground level, and being part of the decision-making process
- Clean and bright facilities

Advantages to incubator investors (state/federal organizations)

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|-------------------------------|------------------------|
| • Fills gaps in local economy | • Job creation |
| • Tax base expansion | • Job diversity |
| • Enhanced community image | • Economic development |
| | • Economic innovation |

Advantages to community where incubator is located

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| • Investment opportunities | • Job creation |
| • Revitalization of deteriorated areas | • Economic development |
| • Stimulation of real estate development | • Economic diversity |
| • Enhanced community image | • Economic innovation |
| • Creation of marketing outlets for community products and services | • Retain home-grown talent in community |
| • Fills gaps in local economy | • Creation of viable local companies |
| | • Tax base expansion |

Conclusion

In new and knowledge based economy, Knowledge and technological capabilities are becoming increasingly crucial for national development. Using technology incubator and incubation system is a practical way for creating knowledge and technology based firm. Technology incubator can strength and promote technology ventures. Technology venturing through incubator activities is an important tool for the commercialization of R and D outputs and the transfer of technology.

References

1. OECD, 1996 , " **TECHNOLOGY INCUBATORS: NURTURING SMALL FIRMS**"
2. Agence Nationale Pour La Creation Et Le Developpement Des Entreprises, (ANCE) (1997),
www.ance.asso.fr
3. Colin barrow , (2001) ,incubators, Johan wily & sons Ltd.
4. http://www.sandpoint.org/pride/library/assessment_TOC.htm
5. http://www.sandpoint.org/pride/library/Articles_TOC.htm
6. http://www.sandpoint.org/pride/library/incubator_types_TOC.htm
7. http://www.sandpoint.org/pride/library/incubator_stats_TOC.htm