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Business Incubators in Economic Development:

an initial assessment in industrializing countries

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United Nations Development Programme, New York
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United Nations Industrial Development Organization, Vienna

New York, 1996

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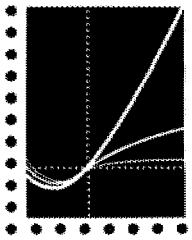

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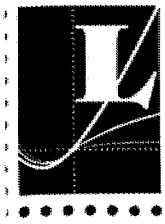

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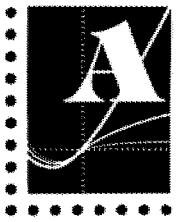

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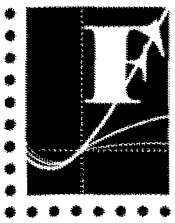

FOREWORD

The primary goal of the United Nations Development Programme is to ***eliminate the scourge of poverty*** in its partnership countries. The development of sustainable enterprises, which offer meaningful employment and which create added value for the economy, is one of the most effective means of achieving that objective. It is for this reason that UNDP has established a ***Private Sector Development Programme (PSDP)***, charged with the responsibility of assisting national governments and their partners in private enterprise to develop effective and self-sustaining ventures. These ventures in turn will help create and disseminate the wealth that eradicates poverty, developing national economies which provide for a promising future within the global marketplace.

For nearly 10 years, UNDP and other United Nations agencies have been supporting the application of ***technology and business incubators*** as useful instruments in promoting both the start-up of new enterprises and their survival during their first years of existence. Incubators are an important component of the work of the United Nations Fund for Science & Technology for Development. They have also become one of the primary "products" of PSDP, and have been used actively by the United Nations Industrial Development Organization. Given the importance of incubators in many development programmes over the last three to five years, it was apparent that a global assessment of the impact of incubators could contribute to their future implementation. With the support of the Organization of American States and UNIDO, UNDP was able to undertake a critical examination of incubators in seven countries. This report documents the results of those studies. With the support of the Special Unit for Technical Cooperation among Developing Countries (SU/TCDC) of UNDP, a Global Workshop was held in Tianjin, Peoples Republic of China, 21-23 September 1995, with representatives from some 24 nations in attendance. The results of this study were examined at the workshop by development professionals from around the world. Their feedback has been incorporated here.

As the reader will discover, ***incubators are a cost-effective instrument in the creation of new enterprises and in the development of jobs. A total of around 26,000 jobs have been created by the 78 incubators studied in this assessment.*** It must be noted however, that this is a work in progress. The time-series of data collected from incubators in industrializing countries needs to be extended over a longer period, and the implications in terms of enterprise survival and direct and indirect job creation need to be better quantified. We hope this study will serve as the basis for future research.

The case for incubators is proven and strong and needs to be applied in other industrializing and restructuring economies. For that reason, UNDP, with the support of other agencies, proposes a series of regional workshops at which this assessment will be reviewed, and application of the incubation system to various national economies further examined.

Special appreciation must be expressed to the national consultants who completed the field studies, and to the project management team of Jack Bishop, of Bishop Associates, and Rustam Lalkaka, Senior Advisor to PSDP.

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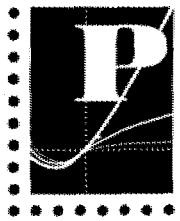


PREFACE

Business incubators are sprouting up rapidly all over the world—numbering approximately 1,500 today, up from about 300 a decade ago. In the industrializing countries, around 250 of these incubators are now operational, with varying degrees of success and sustainability. Given the current climate of downsizing, privatization, and globalization in the world economy, now seems an appropriate moment to assess their recent history and effectiveness, both as an instrument of development policy and in the creation of new businesses. In this study we take a look back at the past five to ten years of the incubator concept in action, before leaping forward to consider its possibilities as a tool for generating future enterprises and economic growth.

Some background may be necessary for readers unfamiliar with this development modality. A ***business incubator*** is defined here as a controlled work environment, designed to foster the growth of new and emerging companies. This environment is distinguished by particular characteristics, intended to create a collegial climate for the training, support and development of successful small entrepreneurs and profitable businesses. These characteristics include: careful initial selection of early-stage or start-up entrepreneurial firms with potential for growth; designated work spaces provided for each tenant; shared facilities necessary to operate a business, such as communications and administrative support; a small management team who train, develop and assist new entrepreneurs; access to critical professional services such as legal and financial assistance; affordable rents and fees for services; and businesses "graduating" after three or four years of residence at the incubator. While local, regional or national government agencies usually help establish the facility and support its early operations, the incubator is generally managed as a business itself, often with a plan for achieving fiscal self-reliance following its initial years of operation.

Typically, each incubator may have 10-30 selected "tenant companies." Most of these will survive, and a few will become very successful, generating large sales and employment. The rationale for the use of an incubator system in economic development is that it is a remarkably flexible instrument which supports fledgling enterprises in a variety of ways. At the local level, incubators are supervised by an autonomous board of sponsors from area institutions, both public and private. By design, incubators are created to speak to local community values and aspirations. Locating client businesses on-site fosters a "deeper" learning and problem-solving experience. Organizations with no tenants on their premises, lack the critical distinction that makes incubators effective. Such institutions are more like traditional small enterprise development centres rather than incubators. Incubator-like arrangements are not considered in this assessment; however, if their numbers were combined with incubators themselves, the total world-wide would exceed 3,000.

Rapid growth invites critical attention. The incubator concept is both praised as a useful tool for creating enterprises and damned as an expensive fad that does little for economic development. Rhetoric aside, firm empirical assessments that support one or the other verdict, or something in-between, are still wanting. It is into this gap we introduce this study.

Methodology

This study analyses a common set of issues in the experiences of incubator programmes in Brazil, China, the Czech Republic, Mexico, Nigeria, Poland, and Turkey. Countries were selected which have had incubators in operation for at least three years, and which offer a variety of experiences, both positive and negative. In the interest of objective analysis, the range of experts consulted was also balanced, with half involved in incubator

management, and half representing a broad spectrum of industrial development experience.

A steering committee at the United Nations Development Programme/Private Sector Development Programme in New York guided the work of this study. Its objectives are to shed empirical light on the characteristics of incubator programmes, and to assess the role they are playing in creating entrepreneurial businesses and related employment, as a complement to other small enterprise development mechanisms. It is also intended to draw broad conclusions on how incubator performance and contributions to economic growth might be enhanced under the difficult conditions of industrializing countries and others en route to becoming market economies.

In addition to the review at the Tianjin workshop, this assessment has benefited from peer appraisal by independent experts familiar with the business development and policy environment.

Constraints

Due to constraints of time and funding, the national consultants and co-managers were not able to meet at the start of the study to plan a uniform method of data collection. Coordinating the work of consultants thousands of miles apart was a daunting task, even in this day of electronic communication.

Compounding the problem of informational and methodological inconsistencies in the country studies, the availability of performance data turned out to be less than anticipated. Incubators and small business support projects the world over generally have little time and few resources to devote to record-keeping. Furthermore, the incubators in developing countries are relatively new programmes, at the maturity level of those in the US a decade ago. Had this exercise been postponed, however, the data available at a later date would probably have been no better. Undertaking the assessment at this time should contribute to further research and more thorough analyses.

This is a first step in locating the effectiveness of incubators in the context of other small enterprise support modalities, and towards identifying ways of better defining the role of incubators in the developing country environment. This study will also alert managers to the need for better records documenting both incubator and tenant operations, and provide timely advice to planners of small business programmes. We expect it to result in positive action among emerging incubator associations and other fora, forming the basis for more informed decisions on how (and whether) to start, operate and sustain successful incubator programmes.

Part One of this report begins by placing the business incubator in the overall context of small enterprise development, its policy environment and support programmes. Operating characteristics of incubators are delineated for each country represented in this study. Thereafter, we attempt to assess the effectiveness of incubator programmes through the criteria of new enterprise creation, employment generation and sustainability. We conclude by looking at some implications for policy, future research and follow-up action.

Part Two provides summaries of the studies conducted in the seven selected countries. These nations are home to almost two-thirds of the estimated total incubators in the developing and transitional economies. Case studies of selected incubators are included, demonstrating the wide range of actual conditions under which the modality operates.

OVERVIEW

1. The seven countries studied have among them some 140 business incubators, constituting a significant percentage of the estimated total of 250 incubators in the industrializing countries and transitional economies. These countries differ markedly in policy orientation and technical infrastructure, and their *incubators cover a wide range in size, characteristics and performance.*

Incubators in the Context of Small Enterprise Development

2. All the countries examined here have a variety of technical assistance and credit facilities to promote small enterprises (SEs). While over the last five decades, many millions of dollars have been spent on such programmes, there are practically no cost-benefit assessments of their effectiveness. The incubator, a relatively recent development, also has not been seriously evaluated. It is therefore not yet possible to make comparisons on a quantitative basis between the incubator and other SE support schemes.
3. ***The incubator should be considered as one additional device in the tool-kit of small enterprise support modalities.*** It has been derived from these modalities, with some distinguishing features. It has a special niche, that of nurturing selected early stage ventures through focused assistance within a supportive environment. An incubator complements other policy instruments.

Characteristics of Incubator Programmes

4. The business incubator, like other systems, may produce excellent or poor results depending on its adaptation to suit local needs, the commitment of its sponsors, the skills of its management team, and the policy framework within which it operates. Meaningful analyses of incubator effectiveness can best be made by in-depth studies of selected facilities and programmes with similar purposes. The main features of the incubators studied in this project are summarized below:

Main Features of Incubators Studied

	Sample	Building sqm		Tenant	Tenant Firm	Investment
Country	Total	Gross	Net	Firms	Employees	US $000s
All, median	142	2,500	1,521	12	94	236
Brazil	16	1,225	600	10	43	—
China	32	6,100	3,036	22	318	78
Czech Rep.	17	—	2,230	16	105	175
Mexico	6	1,550	420	7	98	468
Nigeria	2	2,700	1,860	7	44	864
Poland	19	1,603	1,593	11	58	—
Turkey	4	2,086	974	19	82	441

5. While the process of establishing and operating an incubator may be similar in various environments, the results vary widely depending on its objectives and other local factors. ***The character of the leading sponsor influences the desired goals,*** for instance:

Sponsor	Desired Goals
University/research organization	Innovation, research commercialization
Public/private partnership	Investment, employment, social focus
Private sector initiative	Income from services, tenant profitability
Venture capital-based	Winning enterprises

Multiple sponsors of incubators bring a variety of orientations and strengths, but also potentially place incubators in the position of striving for conflicting goals.

6. On average, incubators in industrializing countries are quite young. The median number of graduates among the incubators studied (for a government-sponsored facility which opened in 1992) would be ***eight graduates after three years,*** with two to three firms having discontinued their businesses.
7. A comparison of these parametres and others with those for USA incubators, demonstrates that, in spite of their youth, the industrializing country incubators have similar graduation and discontinued business ratios. In general, the incubators in industrializing countries are smaller, and support more and smaller tenant companies.

Comparison of Incubators in Industrializing Countries and the US

	Industrializing Countries	United States[1]
Years of Operation		
Less than 7 years	94	54
7 years or more	6	46
Gross Building Area (median square metres)	2,500	—
(mean square metres)	3,900	5,500
Tenants per incubator (median)	12	10
Employees per tenant (median)	7	10
Graduates per incubator (median)	8	8.5
Discontinued business per incubator (median)	2.5	3

8. The types of programmes offered are also observed to be similar. Some of the incubators surveyed provide their clients with a wide range of support services, including debt guarantees and direct equity financing. Most provide the traditional services, such as business planning, accounting and management development, together with shared office facilities.
9. ***The reported investment of US $230,000 for developing the median incubator is modest.*** Such a low cost, however usually represents the support of public or donor agencies who have provided buildings, feasibility studies, training and initial operating costs.

[1] National Business Incubation Association, 1996.

Assessment

10. The broad criteria used in this assessment were as follows:
    - The kind and number of new ventures created in the incubator
    - The number of direct jobs generated by the incubator
    - The contribution made to the development of entrepreneurial culture and the promotion of research commercialization
11. The linkages between technology incubators and research institutes and/or universities appears to be effective. Business incubators benefit from private sector participation through mentoring, spin-offs from larger enterprises and subcontracting. With the notable exception of Brazil, private corporations have been slow to support incubators. The development of new sponsors for incubators should be a fruitful area for continued effort.
12. The economies of scale involved with the modality indicate that smaller incubators are less likely to develop financial sustainability. Incubators of less than 2,500 square metres face difficulty in raising rental and other revenues sufficient to cover expenses.
13. ***The importance of tenant finance as a key component of a successful incubator programme*** has been recognized. There is a strong need for a portfolio of financial instruments, possibly imbedded in the incubator programme, with a role for incubator-based counselling in the development of financial strategies. Interestingly, the managements of several Chinese incubators are taking equity positions in tenant firms.
14. A careful tenant selection process and viable exit criteria are found to be essential. Above all, ***the role of the manager is recognized as pivotal to incubator success.*** Difficulty in finding entrepreneurial, skilled managers has been a severe problem in many of the countries studied.

Determinants of Success

15. The Tianjin, China incubator, posting an enviable record of financial sustainability, attributes its success (56 tenants, 12 graduates, no losses, and increasing profitability) to six factors:
    - *Government support:* policy guidance and financial support from the national TORCH programme through the municipal government and the Tianjin Science and Technology Committee
    - *Location:* the technology-industry zone provides a knowledge-intensive environment adjacent to famous universities that offer the necessary technological infrastructure
    - *Service:* the ability to provide a range of services for new enterprises
    - *Management:* keen-witted and capable management, with high efficiency in providing whole-hearted service to tenant enterprises—not solely profit-driven
    - *Networking:* extensive communication with all walks of life; support from departments of industry and commerce, and from tax, banking, utility and security agencies
    - *Enterprise development:* careful selection and optimization of tenant enterprises, studying both the firm's project and its management, while addressing problems in funding and marketing

Impact

16. Business incubators face significant challenges in countries characterized by recent economic and politica turmoil. Given an environment of political stability, ***incubators are establishing a record of success in creating enterprises, as well as in supporting economic restructuring.*** In addition to their direct support of enterprise (and job) creation, incubators provide planners with a window to observe the process of venture formation, and to assess the effectiveness of regional development tools.

17. Incubator programmes in countries such as China, the Czech Republic and Poland have produced strong results. Incubators in some of the other countries studied are still having difficulties, and their operations have not yet reached maturity. In all cases, the incubator has to be seen as a ***social investment by governments, with a clear understanding of the extent and duration of the initial financial support that is required.***
18. Even though the median year of opening for the incubators was 1992, the study demonstrates that ***incubators in industrializing countries are making a significant impact on economic development.*** For example, 17 incubators in the Czech Republic were associated with the creation of 440 enterprises—an average of about 26 companies and 100 jobs per incubator over approximately three years. Incubators that responded to the survey question concerning business creation (142), have claimed to be supporting 3,000 new businesses.
19. Among the 78 incubators reporting employment figures for their client companies, a total of 26,000 jobs have been created. Although only a small number of incubators responded to the question regarding survival rates, the responses indicate that ***an enviable 80 per cent of graduated businesses are succeeding.***
20. While the incubators studied share many characteristics, the varying circumstances in each country affect the nature and extent of the various incubation systems. Consider, for instance, China. Starting modestly in the late 1980s, China has developed the largest business incubation systems outside of the US, occupying 23 million square metres of space and serving 1,969 enterprises with gross sales of almost $200 million in 1993, and with 159 enterprises having graduated. The system is being expanded from the current 73 to 200 incubators by the year 2000. These facilities are expected to serve 10,000 new enterprises and graduate 1,200 businesses per year.
21. Incubator performance is diverse. What emerges from the data is a protypical incubator profile based on the available information from those studied. This hypothetical projected incubator, with 2,300 square metres of gross space, would have 17 resident companies with a total of 136 workers, and sales of almost US $1 million at the end of year three. At the end of year six, some 25 companies would have located in the incubator, with 18 graduated enterprises, employment of about 600 persons, and sales of $1.4 million. On the basis of a renovated building and a total initial investment of around $500,000, the cost per job would be $3,676 in year three, dropping to $2,500 in year six. This excludes indirect employment as well as jobs at companies serviced outside the incubator.
22. Based on visits to incubators in the study countries, other benefits were found to include the following:
    - The incubator, when linked to a technical university and with a technological orientation, has a strong impact on the ***utilization of faculty, facilities and students, as well as on the culture of university-industry relationships.***
    - The incubation process can be expected to ***increase markedly the survival rates*** of early-stage businesses, when compared to those started outside of the incubator. This represents a significant benefit to the community and to the entrepreneur and is due, of course, to the focused attention on a small, selected group.
    - The incubator would have ***other non-quantifiable benefits***, such as stimulating a culture of entrepreneurship, and influencing national policies toward supporting small, private enterprises.
23. A business incubator is not necessarily capital-intensive and could reach break-even in about three to four years under the right conditions, although it would take longer to recover the initial investment. The incubator is, however, ***human resource intensive***, requiring an experienced management team and a network of professional support.
24. A criticism of business incubators is that they attempt to do too much with limited resources, a situation which both sponsor and management must guard against. It also can be argued that ***the incubator is***

elitist in targeting support to a selected group. This is necessarily so, but ways can be devised to increase the throughput of companies, to serve businesses outside the incubator, and for the facility to become a focal point of entrepreneurial activity and assistance within the community.

25. The picture that emerges in this analysis, and confirmed at the Tianjin, China workshop, is of ***incubators as a study in contrasts.*** Frequently supported by the government, incubators are charged with a social agenda. A balance is needed between the sponsor's patience in achieving results, and an entrepreneurial drive to accomplish those results on the part of the incubator staff. While incubators could not be characterized as a magic potion that provides universal success in small enterprise development, they have produced good results provided that the basic conditions exist. These are:
    - Political stability and presence of basic business infrastructure
    - Supportive regulatory and legislative frameworks
    - Initial state financial support
    - Strong board and management team
    - Willingness on the part of all parties to adapt the concept to local culture and communities

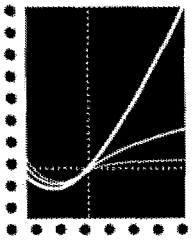
    Considering current trends, incubators in industrializing countries may well ***double in number to more than 500 within the next five years.***

Data Limitations

26. Since many of the incubators studied have been operating for only three to four years, we do not yet have reliable data on the growth of sales, employment or innovations (or on future bankruptcies) from the companies which have graduated from the incubator. The effects of additional jobs, sales generated and survival rates could be significant, and would enhance the overall performance of the incubator. A time-series of expenses and revenues is also needed over a longer period to determine when incubators become self-sustaining. At present, most incubators depend on some percentage of operating subsidy as is the case for the majority of incubators in industrialized countries.
27. The potential to ***develop a "second generation incubator" is becoming apparent.*** This incubation system would de-emphasize low rents and focus on enhanced business services, both for tenants and non-resident affiliates on an outreach basis. Further, such a programme would " pre-incubate" nascent entrepreneurs and would also help those who have graduated.

Follow-up Actions

28. This assessment is a first step in the process of determining the real role of business incubators as a complement to other SE development and support schemes. The analyses now begun need to be intensified and continued in the coming years.
29. At the Tianjin, China workshop, the participants declared that "the rich exposure and interactions now begun, deserve to be sustained," and requested a continuous dialogue through organization of an informal network, which could be formalized at a later date. Participants proposed a quarterly news-letter, benchmarking activities, and an incubator directory. Regional workshops are now planned to pursue this agenda in the future, specifically in Africa, West Asia, Latin America, and the restructuring economies of Eastern Europe and the Newly Independent States.
30. The roles played since 1987 by UNDP and other UN agencies in initiating business incubators in various countries is recognized, with appreciation. Similar catalytic inputs need to be continued by the UN system, as well as by other organizations, such as the Organization of American States, the European Business and Innovation Centre Network, and the National Business Incubation Association, USA.



Part One
The Role Of Incubators

1 INCUBATORS IN THE CONTEXT OF SMALL ENTERPRISE DEVELOPMENT

rapidly changing global economy, small enterprises (SEs) are increasingly a force for national economic vth. Since the 1980s, SEs—and the entrepreneurs who drive them—have received serious attention by ıners, legislators, and development practitioners the world over. New structures and strategies are being ored that will help small businesses start, survive, and grow. In this quest, the business incubation centre has rged as a recent innovation, harbouring great potential as a tool for economic development.

Given that many national planning regimes already contain programmes addressing SEs, this study attempts ssess the role of incubators as a complement to other small enterprise promotion mechanisms. This chapter ıares the background for an assessment of the incubator modality by reviewing the range of small enterprise ort measures currently practised, what has and has not worked, and the performance measures and lessons can be derived from these. This background locates business incubators in the overall context of SE develop- ıt, its support systems, and regulatory frameworks.

1 Small Enterprise Characteristics

The new global economy is increasingly characterized by three processes: the overall lowering of trade barriers concurrent emergence of regional trading blocs; the shift towards information and service-oriented activities, rder to create new competitive advantages in the world market; and the downsizing of large organizations, ether with mergers and acquisitions, in the face of this restructuring. These factors are, in turn, shrinking ortunities for persons to join the labour force; thus, those unemployed who are able, are increasingly turning he creation of entrepreneurial small businesses. The continuing interest in promoting SEs is based on otheses regarding their effectiveness in providing livelihoods for those otherwise unemployed. An in-depth mination of these hypotheses is beyond the scope of this study; however their validity seems to be borne out recent economic data.

ployment

SEs are generally seen as labour intensive, capital-saving, and an effective means of creating most of the one ion new jobs the world will need by the end of this century.[1,2] There are many reasons for this: SEs are flexible l adapt well to a rapidly-changing technological landscape. By providing goods and services in small batches h rapid deliveries, they complement the activities of large-scale industry and work in symbiosis with it. In n, SEs frequently seed the activities of other entrepreneurs, creating businesses built on value-added products l services. Small enterprises moreover, generate more innovations per research dollar than large corporations in umber of sectors of the economy.

As net job creators, even in periods of recession, SEs help raise incomes, distribute them more widely, and ıaden participation in asset management. Using the personal savings of entrepreneurs (and those of their ıily and friends) to start businesses, followed by retaining earnings for expansion, they mobilize latent ources, both human and financial. In economies in transition, from command systems to open markets, small siness is generally the start of private sector activity. Indeed, SEs can serve as a seed bed for developing the

ıuta, E. and S.V. Sethuraman, 1984
ıley, E. and R. Morce, R., 1965.

skilled worker base needed for industrial expansion.

In addition to mobilizing local resources, SEs, through competition and cooperation, effectively revitalize the local economy through regional and export trade. They occupy unique market niches, producing goods which, due to transport costs or consumer preferences, might be prohibitively expensive if manufactured, distributed and warehoused on a large scale. In rural areas, SEs have successfully combined modern processes with traditional small-scale production, significantly improving output-to-capital ratios when compared with large capital-intensive operations. Examples include: sugar processing in Kenya, rice milling in the Philippines, and spinning in Thailand.[3]

Historically, the role of SEs in the development of industrial economies differs from country to country, and from decade to decade. Countries such as the Republic of Korea started their industrialization based on large conglomerates, and then later turned their attention to small enterprises. Europe has 5.5 million small enterprises employing over 70 million people — 70% of the work force. Today, SEs in Japan (less than 300 employees per firm) constitute 72% of all manufacturing employment and 55% of value-added services. Elsewhere, notably in Taiwan, development was initiated through small businesses, which later grew to become world-class corporations. In between, countries such as India started with large import-substituting complexes following the socialist model, while also promoting cottage and small units in a Gandhian mode.

Classification of Small Enterprises

The size classification of enterprises—by employees, fixed assets, turnover, and technology-level—varies to suit each country's unique conditions, serving as a guide to apportioning the government's business support services. Divergent national definitions both of small enterprises and their support programmes make international comparisons difficult, but such difficulties are inevitable and inherent in any study of this nature. In the middle of the broad spectrum stretching from the tiny, proprietor-run firm, to the large multi-national enterprise, the business incubator exists in a special niche, serving a select population.

Small to medium-sized enterprises (the so-called SMEs with up to 200 employees) typically constitute at least 95% of businesses in most countries, both developed and developing. They may contribute one-third of manufactured output, provide at least half of the manufacturing jobs, and one-third of the total exports. The exception to this is found in the economies of the former socialist countries, where SME contributions were usually less than 10% of gross national product.

The high performance of the East Asian economies owes much to the production, productivity and exports of SMEs.[4] While their growth has been propelled by market forces, various government-sponsored credit and technical support programmes have played a role in supporting them as well. In Singapore, SMEs are not a significant presence in terms of their number or gross employment provided; however they play a dynamic role both in attracting and serving multinational corporations.

Small businesses have been compared to a zoo-like collection of animals. In behavioural terms, the metaphors used are the ***lion***, pursuing opportunities relentlessly while making full use of its habitat; the ***mule***, resisting change but surviving; and the ***turkey***, having no sense of direction and being gobbled up.[5] One such classification for the US identifies ***elephants*** as the 7,000 large corporations in the economy, and ***mice*** as the 6 to 7 million small firms (about 1.4 million starting each year and, simultaneously, 1 million going out of business). Most of the growth in economies comes from ***gazelles***, about 700,000 high-achieving businesses with growth rates of 20-30% annually in their initial years.[6]

[3] Netherlands Ministry of Foreign Affairs, Nd.
[4] World Bank, 1993.
[5] Atterton, Tim, 1994.
[6] Birch, D., 1992.

The developing countries have a proliferation of ***mice***; that is, the informal, cottage, and family enterprises which constitute the bulk of the total number of businesses, each with less than 5 to 10 employees. They provide considerable employment, however, generally paying only subsistence wages. These small firms flourish despite severe constraints, most particularly due to the lack of access to credit and technical expertise. Pursuant to the high priority given to poverty elimination programmes and job creation initiatives by governments, the World Bank, UNDP, and donor countries have formed the Consultative Group to Assist the Poorest. This group provides micro-loans, some as little as $100, through established lending institutions to grass-roots businesses.

At the other end of the spectrum are the large private and multinational enterprises, usually with 200 employees and above. Programmes are underway to downsize, restructure and, if government-owned, privatize these ventures. For policymakers, these programmes in turn imply needed efforts to retrain workers for new jobs, or for starting their own businesses.

In most economies there is the so-called ***hollow middle***, a space which should be occupied by modern small enterprises numbering 10 to 200 employees. While efforts are required to help informal businesses grow into modern enterprises, the real niche of the business incubator is the middle category, that is, selected early-stage and start-up firms which are often in knowledge-based goods and services, and have the potential to grow rapidly. Such firms may typically enter the incubator with a staff numbering one to four, growing in two to three years to a staff of 10-20. Some, upon graduating, may double their turnover rates approximately every three years. Reverting to the earlier metaphors, these businesses are both gazelles and lions, or ungainly hybrids which we may call ***gazellions***! The ideal tenant of an incubator is really the potentially big enterprise which happens today to be small (i.e. the lion masquerading temporarily as gazelle).

Exports

Data on exports of SMEs is often unreliable, as much of their trade is conducted through intermediaries and wholesalers. Exports from SMEs in China and the Republic of Korea are more than 40% of country totals, more than many other countries. Their cumulative productivity growth and efficiency in exporting have been due as much to domestic efforts as to infusions of international technology. In most countries, however, exports are confined to a small percentage of SMEs, with the majority continuing to operate at low quality and technical levels, and facing serious management and marketing barriers. An interesting trend among some SMEs is the tendency to become "mini-multinationals," setting up cross-border subsidiaries and joint ventures as their trade with neighbouring countries grows.

Small enterprises are more vulnerable to currency fluctuations and protectionism in export markets. In Japan their share in total manufactured exports dropped from 60% in 1956 to 50% in 1993 due to these factors. Those SMEs operating productively in a dynamic, "information-rich" marketplace, frequently interacting with buyers and sellers, can often better acquire both the technology for improved productivity, and the needed skills to survive in volatile export markets.[7]

Technology and Small Enterprises

As noted, most tiny enterprises operate at low, often obsolete levels of technology. Existing operations need to be upgraded, working towards improved product design, productivity, and quality. Small technology-based enterprises also frequently need management and marketing assistance. While individual firms may not be able to afford technological research and consultancy services, clusters of small enterprises can affordably contract public or private laboratories and consultants to undertake generic studies for common problems. The task here is not merely to scale down or to transfer technology and management techniques from large enterprises, but

[7] Levy, Brian, et al., 1994.

rather, given SE constraints, to develop new managerial options or adapt currently existing models to local contexts.

Small, knowledge-based firms in industrial countries create as many, if not more, innovations than large ones. The basis for numerous business development programmes around the world is an orientation toward technology. Such programmes can also be a means of universities gaining value from the intellectual property developed out of their teaching and research missions. Thus, an economic development programme can be expanded by the technological expertise available from local universities. Of the 130 institutions that responded to a licensing survey by the US Association of University Technology Managers (AUTM), small business represented the majority of licensing bodies. Of the 440 licenses granted, 60% were to small businesses.[8] Over 400 spin-off companies have been formed out of associations with US universities. The emergence of the "entrepreneurial university" has contributed significantly to the growth of the "learning company."

Smallness Can be an Asset, or a Liability

No sooner had the importance of small enterprises become part of development orthodoxy, then their true role in the economy began to be more deeply examined. It is argued that while a large number of small businesses are created every year, a huge percentage of these also disappear over a 5-year horizon—some 50-80% in the US, depending on the maturity and ownership of the plants, how they are classified, and who does the counting.[9] If small enterprise support programmes, such as incubators, can reduce this failure rate by just 10%, the savings to the overall economy can be quite significant.

The US economy has been compared to a thundercloud, with severe updrafts and downdrafts, job growth and loss, bankruptcies and new business formations. For instance, one-third of Fortune 500 companies are now being replaced by new companies every four years—formerly, in the 1950's, it took 20 years to do this. The US owes its resilience and growth to this enormous turbulence—the decline of opportunity with large ***enterprise***, giving rise to the ***entrepreneur***. The restructuring, downsizing, out-sourcing of supplies, and decentralizing of decision-making is causing big companies to behave like small entrepreneurial ones. At the same time, through mergers, alliances, clustering, and networking, small companies are mimicking the large.

Small enterprises do not have the political clout, financial muscle, managerial skills, or the world-wide networks that enable large companies to access information, secure finance, and identify and penetrate markets. In this sense, their smallness is a liability. The policy framework in most developing countries also provides little incentive for them to become registered, and to pay taxes, upgrade technology, provide better stability and safety to staff, or to clean up pollution in their manufacturing processes—all of which are overtures to legitimate, legal growth.

1.2 Improving The Business Environment

The prerequisite for healthy SE sector development is a favourable macroeconomic framework that ensures a stable national currency, controlled inflation, and predictable exchange rates. A sound commercial framework consisting of more open markets, cost-effective systems for delivering credit and technical support, protection of intellectual property and the environment, and consumer assurance of quality, is also essential for business formation and growth. In developing countries, the state clearly has a role in creating supportive conditions; in organizing infrastructure, including a functioning telecommunications system, connections to utilities, and accessible transportation, as well as in educating a cadre of skilled workers, technicians, and managers. For strong regional development, a balance has to be struck between the State's overall functions and the bottom-up involvement of stakeholders in project formulation and implementation.

[8] Hoffman, D.C., 1994, p. 3-4. Representing 45 institutions, 35% response rate.

[9] Davis, Steven, John Haltiwanger, and Scott Schink, Nd.

Enabling Policies

Policy and regulatory systems should: simplify the registration process and reduce the costs for starting a business; streamline import/export regulations; encourage the banking and development of a capital system, enabling small enterprises to secure the funds needed for growth; establish a legal system which protects business rights and property, settles disputes, and administers taxes fairly; formulate labour laws which lower barriers for exit and entry of employees, and promote affordable health insurance and pension schemes; facilitate access to raw materials and public procurement (as small businesses lack the economic or political clout either to be aware of business opportunities or to negotiate competitive terms); help small enterprises attract foreign investment and technology, as well as to invest and transfer their know-how abroad; and provide incentives for large enterprises to contract research, custom manufacturing, and special services from smaller firms.

Further recommendations regarding the overall policy environment include: [10]

- Regulatory arrangements should be consistent, non-discriminatory and simple. The small business owner does not have the staff to comply with burdensome reporting procedures, and onerous tax and labour codes. The costs of environmental compliance must also be considered.
- The private SE sector needs to be consulted regularly through its intermediary associations, unions, and chambers, on policy matters that affect its operations.
- A serious obstacle for small enterprises is a lack of knowledge about, and access to, markets. In this regard, the state has a role in ensuring that public sector procurement is on a competitive, transparent basis.
- In post-communist nations, the need for legislation and strategies to improve the business environment is more urgent. The legal system, especially in areas relating to contract law and property rights, has to be better established. There also needs to be greater advocacy for business to inform the public of the contributions that private entrepreneurship can make. This will counter popular perceptions of such activity as being deviant or anti-social.
- The state can encourage the creation of sound, imaginative funding mechanisms, linked to regulatory reform and technical assistance.
- Accurate and timely trade and market statistics need to be compiled—as they are presently poor or non-existent—in order for businesses to make informed decisions.
- As small business activities concern a variety of public interest areas within a nation—industry, cooperatives, rural development, youth—a government "focal point," or designated representative, would be useful to co-ordinate them. Indonesia now has a separate ministry to manage these concerns, while India has long had its Small Industry Development Organization.

The state's role is to promote, not to unduly control, small enterprises; to prime the pump and then let entrepreneurs operate and maintain it. This requires a cultural environment and technical infrastructure that encourages entrepreneurism. An SE support mechanism which is successful in one environment, may fail in another where policies and conditions are unfavourable.

National development schemes, often either led or pushed by donor countries contributing technical assistance, change every few years with shifts in prevailing funding priorities. Past national programmes have lurched between the following: first, encourage cooperatives and informal businesses; then, create a plethora of state agencies to support small enterprises; build industrial estates and set up private-public-university partnerships; then target the poorest of the poor; privatize the large state undertakings and promote the entrepreneur; and build incubators. These are not mutually exclusive programmatic options, and all could be pursued in a balanced and complementary manner, while learning from mistakes and building upon successes.

[10] For discussion of state policies for small business, see also Reichmuth, M., 1994, and United Nations Committee on Trade and Development, 1995

1.3 Small Enterprise Support Programmes

In addition to removing the regulatory barriers and policy biases against SEs discussed above, effective support programmes are required. Such programmes, including incubators, can be enhanced, with their benefit-costs optimized based on the experience gained from similar activities around the world.

Supply-side assistance is generally designed to provide financing arrangements, technical and management consultancies, and human resource development. Other assistance packages provide managed work-spaces, trade and technology information, and mechanisms for networking among small businesses. The delivery agents for these initiatives have been state agencies and, increasingly, public-private partnerships, non-governmental organizations, universities, private companies, and banks (operating either for profit or as a community service). The range of SE support services is indicated in Figure 1-1.

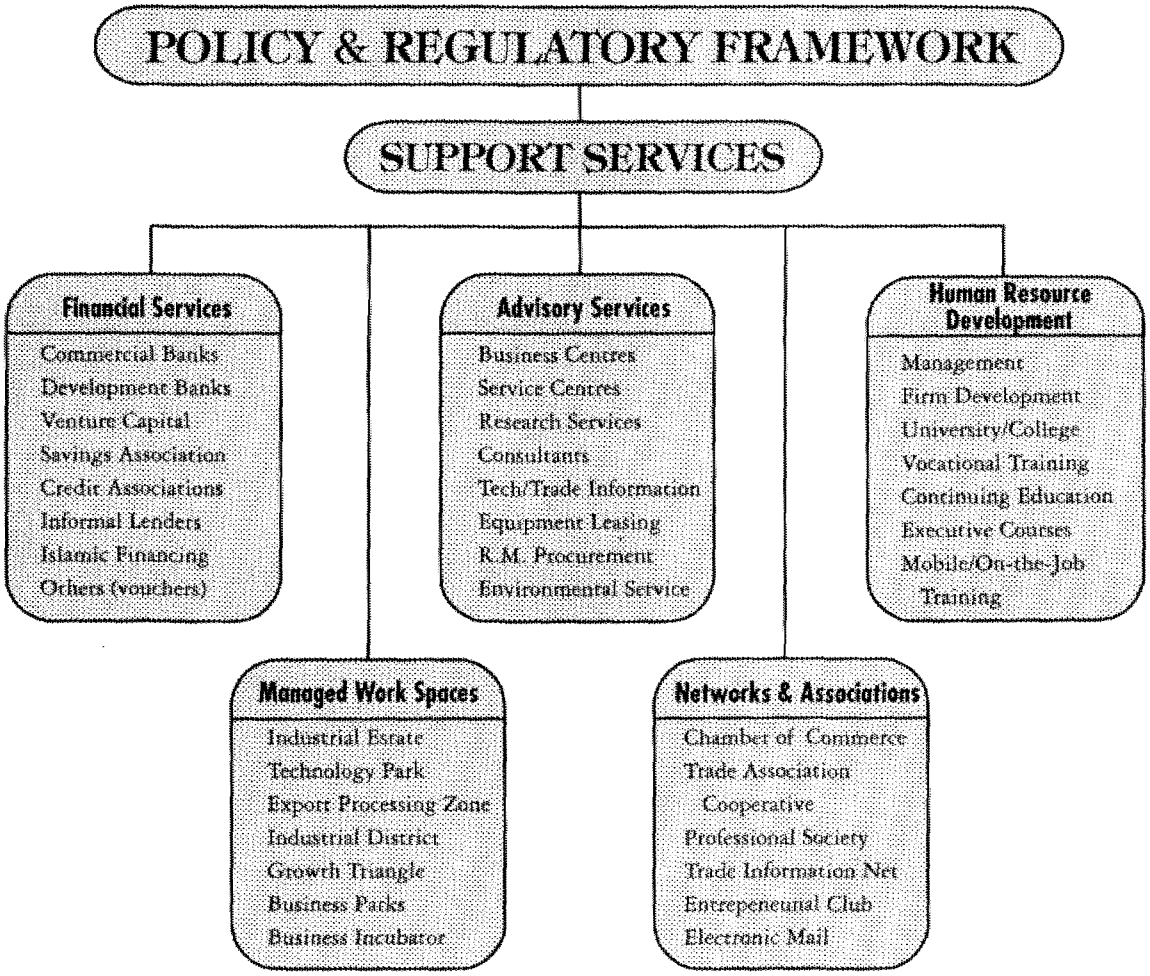
In Thailand, a survey of entrepreneurs undertaken in the planning stages of an incubator indicated that marketing and business planning were the most needed services.[11] In Egypt, the help needed most was in financing and marketing.[12] As an enterprise matures, the services it needs become more diverse and sophisticated, as seen in the case of Singapore (Table 1-1).

Table 1-1: Assistance Programmes by Stage of Enterprise Growth, Singapore[13]

Start-up	Growth	Expansion	Exporting
Computerisation	ISO 9000 Certification	Automation Leasing	Business Development
Finance	Computerisation	Brand Development	Tax Benefits
Product Development	Finance	Business Development	Franchise Development
R&D Incubator	Technical Assistance	Franchise Development	Finance
Skills Development	Industry Upgrading	ISO 9000 Certification	Industry Upgrading
Seed Capital	Market Development	Computerisation	Finance
	Product Development	Finance	Market Development
	Tax Benefits	Technical Assistance	InvestmentDevelopment
	Skills Development	Industry Upgrading	
	Software Development	Market Development	
	Venture Capital	Product Development	
		Skills Development	
		Software Development	
		Business Plan	
		Venture Capital	

[11] Asian Institute of Technology, Nd.
[12] Business and Technology Development Strategies. Survey for Incubator Programme, 1994
[13] Singapore Economic Development Board, 1993.

Figure 1-1: Typology of SE Support Services



Effectiveness of SE Support

Since the 1970s, governments and donors have invested significant resources in establishing small business service centres and a range of other schemes, with varying degrees of effectiveness and sustainability. Some European and US approaches are outlined in Boxes 1-1 and 1-2 . Successes among support programmes have, for example, emerged recently in Spain, Chile, Italy and in China. There are no blueprints for success and no single model of support services suits all countries, given the heterogeneity of needs and conditions. ***There is a consensus, however, that most schemes leave much to be desired,*** as demonstrated by the following assessments:

"Technical advisory centres have been established by some governments, but these are usually inadequate in numbers and dispersion to service more than a fraction of SEs in need of assistance; also, they often become bureaucratic and, politicized, and their staff mediocre or worse because they cannot compete with private employers."[14]

"Training such as that provided in traditional small enterprise programmes has not always proved very successful. Often there was a lack of structural cohesion, programmes were not geared to the needs of the small entrepreneur and too little research was carried out into the effectiveness of training programmes."[15]

[14] Levitsky, Jake, 1987.
[15] Netherlands Ministry of Foreign Affairs, Nd.

Box 1-1: European Approaches to SE Support

The EEC policy instruments in support of economic development within the community include:

Promoting:

The Internal Market, including the Four Freedoms (circulation of Goods, Workers, Services, and Capital)

The External Market, including export promotion, developing country aid, the Centre for the Development of Industry and the loan & risk capital operations of the EIB

Developing:

The Business Co-operation Centre and Networks, and the European Economic Interest Grouping

Financing:

Loans, including the European Investment Bank, New Community Instrument, and European Coal & Steel Commission

Grants, including

Training - European Social Fund, COMETT, Exchange of Young Workers, DELTA

Rural Support - European Agricultural Guidance and Guarantee Fund, and community measures directed at fisheries and aquaculture

Regional Assistance - European Fund for Regional Development, community actions, and "non-quota" measures

Information:

European Information Centres, publications, and data bases

The EC task force in the late 80s noted six major "themes" in, and two "approaches" to, policy.

Theme:

Decreased emphasis on cash grants for equipment and increased attention to specific and long-lasting outcomes (innovation, new products and markets)

Focused assistance on "quality" firms rather than on employment generation

Support for export development, especially in the smaller Member States

Need for more objective evaluations of policies

Varied level of support through the tax system (modest in Germany, extensive in Ireland)

Differential routes and success for policy delivery, from private sources (UK, Italy) to public (Ireland, Denmark)

Approach:

Broad free markets, minimizing intervention and stressing a wider range of economic climate issues

Directly interventionist, distorting the market by implementation of SME supports

"General purpose small industrial development agencies (SMIDAs) are the archetypal mechanisms for supply-side direct-input support. The approach has not been effective at promoting rural small industrial enterprises. It has suffered, *inter alia*, from over-centralization, rigidity, over-emphasis on hardware inputs and a largely urban focus."[16]

"The existing network (of small industry service institutes) is fairly large and has a wide reach. Yet the profusion of services quantitatively and qualitatively leaves much to be desired. The functioning of most institutions is not effective and resource availability is poor. The human resource development has not kept pace with the fast

[16] United Nations Development Programme, Government of the Netherlands, International Labour Organisation, United Nations Industrial Development Organisation, 1988.

Box 1-2: US Approaches to SE Support Systems

A number of federal programmes evolved in the United States that differentially reach a small enterprise audience:

- Agricultural Extension—based on the Morrill Act (1862), the Hatch Act (1887), and the Smith - Lever Act (1914)—integrating agricultural research, education, and technology transfer. Total federal spending was $822 million (1987).
- State technical services, based on the State Technical Services Act (Public Law 89-182, 1965), to help states accelerate the adoption of new scientific and technological advances by industry; funding terminated in 1969.
- Industry/technology assistance programmes, supported by the Stevenson-Wydler Technology Transfer Act of 1980 (PL 96-480) as amended by the Federal Technology Transfer Act of 1986 (PL 99-502).

Concerns remain about the breadth of use and the effectiveness of these initiatives. For instance, a survey of state and local organizations providing business and technology assistance to SMEs elicited 231 completed instruments and rated only one programme at the 70% "good" level:

EFFECTIVENESS OF US SMALL BUSINESS SUPPORT PROGRAMMES

Programme/Organization	Agency	%Used	%Good
Small Business Innovation Research Programme	All	69	74
Small Business Development Centre Programme	SBA	66	55
SCORE/ACE	SBA	48	47
Patent & Trademark Office	Commerce	43	62
Co-operative Extension Service	Agriculture	43	68
Job Training Partnership Act	Labour	41	60
Federal Laboratory Consortium	All	39	63
Centre for Utilization of Federal Technology	Commerce/NTIS	36	60
Technology Utilization Programme	NASA	33	64
Community Development Block Grants	HUD	30	57
Energy-Related Inventions	Energy & Commerce/NTIS	30	58
University Centres Programme	Commerce/EDA	27	69
Commercial Use of Space Programme	NASA	27	67
Small & Disadvantaged Business Utilization	All	27	46
Small Business Investment Companies	SBA	27	47
Industry/University Co-operative Research Centres	NSF	26	67
Trade Adjustment Assistance Centres Programme	Commerce/ITA	25	38
Office of Productivity, Technology, & Innovation	Commerce	24	67
Energy Extension Service	Energy	19	59
Computer & Information Science & Engineering	NSF	18	61
National Appropriate Technology Assistance Service	Energy	19	59
Measurement & Engineering Research Grants	Commerce/NIST	8	53
Scientific, Technological, & International Affairs	NSF	7	57
Trade Adjustment Assistance Workers	Labour	6	46
Math., Science, Computer Foreign Languages	Education	2	50

Notes: *% Used* - % of total respondents who have used the programme
% Good - % of total respondents giving the programme an assessment of "good"
Since the respondents are professionals in the support of SMEs, the low awareness (as low as 2%) suggests at best that certain programmes have a limited constituency.

changing needs."[17]

The above commentators are generally critical of supply-side, collective support programmes. Weaknesses have been identified in these kinds of programmes, but reform has been slow. A joint rural industry evaluation by UNDP and others sets out criteria for effectiveness of institutional support—based on outreach, impact, cost effectiveness, non-redundancy, progressiveness, and capacity to be self-sustaining. The evaluation goes on to say, however: "The data certainly does not permit each type of institution to be judged formally, still less quantitatively, on each of the effectiveness criteria."[18]

1.4 Financing Of Small Enterprises

In surveys to assess the main difficulties of entrepreneurs and types of services needed, the problem of access to finance is usually near the top of the list. In preparation for designing business incubators in many developing countries, finance has been identified as the greatest need. Recent work in Indonesia confirms that the main obstacles faced are lack of credit, high collateral requirements, and inadequate information on the variety of available state assistance schemes. For instance, the requirement that the banking sector allocate 20% of its loans, and the requirement of state enterprises to lend 1-5% of their profits, to small enterprises, is virtually unknown to most small entrepreneurs.

Tax incentives, excise duty exemptions, and subsidized credit may encourage infant industry in the short-term. But over the long haul, the credit, and other related systems, have to be structured to give the proprietor the incentive to pay back the public's investment in the enterprise, thus eventually making the subsidy from the national exchequer available to other entrepreneurs.

Financial institutions consider credit to SEs to be risky and expensive due to their high transaction costs relative to loan amounts, and presumed high failure rates. In turn, small borrowers are deterred by application formalities, prohibitive amounts of collateral required, and lending delays. Problems are compounded where capital markets are weak and when SEs need funding for advanced technology-based development. Large corporations, on the other hand, usually do not have these problems, possessing the means to mobilize significant funding in far less time and at much lower interest rates.

The initial investment in small enterprises is generally from personal savings, family and friends, from cooperative societies, or through informal arrangements, such as money lenders. Expansion capital often comes from the retained earnings of the business. Short-term credits may be from commercial banks, while longer-term finance is obtained from development banks and special institutions set up by governments for small enterprises, as well as from venture capital sources. Risks for such lending can be reduced through credit guarantees, insurance, and through refinancing by official institutions. European and US approaches to financing of small enterprises are shown in Boxes 1-3 and 1-4.

The Small Business Innovation and Research (SBIR) programme in the US is unique in providing opportunities for SEs to obtain grant funding, while simultaneously investing in needed government research and development. It is designed to: stimulate technological innovation, use small businesses to meet federal R&D needs, increase private sector commercialization of innovations from federal R&D, and foster and encourage participation by minority and disadvantaged persons in technological innovation.

This programme is an acknowledged success, not only because it accomplishes its objectives by creating business opportunities for small enterprises, but also in its meeting the government's needs for products and services in a cost-effective manner. At the same time, Small Business Investment Companies (SBICs) provide

[17] Stiftung, Fr. Naumann, 1993.

[18] United Nations Development Programme, Government of the Netherlands, International Labour Organisation, United Nations Industrial Development Organisation, 1988.

Box 1-3: European Approaches To Financing Small Enterprises

The European Community provides three forms of SME financial support: Venture Consort, Seed Capital, and Eurotech Capital. The Venture Consort programme (founded 1985) was set up "... to encourage the formation of cross-border syndicates of venture capitalists in order to promote the growth of European SMEs involved with innovative projects." This programme financially supports up to 30% of the total new equity share capital, normally ranging from ECU 50,000 to ECU 300,000, with reimbursement within seven years (or by contract for either shorter or longer periods).

The EC Seed Capital programme was established as a pilot programme with the objective of fostering enterprise, creation in the Community by strengthening the financing opportunities available to new enterprises and improving the quality and survival rate of seed stage projects. The 24 seed capital funds offer a maximum of ECU 350,000 (generally ECU 25,000 to ECU 100,000) to enterprises with less than ECU 50,000 existing risk capital, annual sales of less than ECU 100,000, fewer than 10 employees, and a total value of share capital at the seed stage of less than ECU 1,500,000.

The Eurotech Capital fund is a pilot scheme to promote private financing of trans-national projects representing a high degree of technological advancement. This fund is restricted to enterprises with 50% of the share capital held by EEC shareholders, with priority given to firms with fewer than 500 employees, a fixed asset value of less than ECU 75 million, and no more than 1/3 capital held by large companies.

Small enterprises lack access to low-cost finance, and many institutions believe lending to SEs is an uneconomic use of capital. However, the World Bank concluded that support for SEs, such as credit and technical assistance, need not entail unacceptable costs in terms of overall factor efficiency if reasonable care is taken in selecting the activities.

equity or long-term loans, together with managerial assistance to small firms.

Seed capital funds represent a special category that is by definition focused on small business. Seed capital is the initial funding (seed) from which an enterprise is started. A recent survey of 36 of the approximately 150 existing funds in the US indicated they provided $500 million to a total of 1,100 investments in 1994. These investments were associated with 33,000 jobs and $27 billion in sales revenues.

A recent development in the US is to make investments in technology companies based on repayment through ***royalties*** on production, rather than interest on credit or profits through equity. The Private Sector Development Programme of UNDP is working on a similar royalty arrangement. Islamic banking concepts also lend themselves to royalty-based investments. Such contracts can, however, potentially complicate subsequent rounds of financing and may reduce the options for exit from the investment.

Countries such as the Republic of Korea, Mexico and India have had varying degrees of success with ***venture capital*** to suit their own financing conditions. The Malaysia Technology Development Corporation made an excellent start, while Indonesia has a dozen initiatives, with a government company (PT Bahana) taking a 20% share in various provincial ventures.

The deployment of venture capital in SME expansion also requires the establishment of an "exit vehicle," since the venture capital investor must have some way to cash out and recoup both the initial investment and associated profit, for subsequent reinvestment or other purposes. While the lack of venture financing is a common complaint, its presence alone is not sufficient to successfully stimulate high-technology development.

Box 1-4: Sources Of Funds For Formal SME Support, US 1989, '000US$

Sources of Funds	SBDC*	UC*	IAC*	TAAC*	TOTAL
Federal Government	$19,173	$4,945	$5,057	$5,807	$34,982
State Government	8,152	7,774	95	0	16,021
Local Government	1,477	104	0	100	1,681
University	10,640	826	1,658	160	13,284
Industry	478	2,503	1,483	419	4,883
All Other	1,981	47	904	110	3,042
Total All Sources	$41,904	$16,199	$9,197	$6,596	$73,893
Type of Establishment					
Manufacturing	$1,380	$2,395	$1,722	$80	
Non-Manufacturing	5,874	369	1,361	0	
Unknown	284	37	44	0	
Total	$7,538	$2,801	$3,127	$80	
Size of Establishment					
Less than 50 employees	$3,948	$2,150	$1,408	$19	
50 to 500 employees	638	570	913	57	
More than 500 employees	2,127	44	722	4	
Unknown	825	37	84	0	
Total	$7,538	$2,801	$3,127	$80	
Type of Establishment					
Manufacturing	$11,407	$1,486	$393	$260	
Non-Manufacturing	57,985	1,333	169	0	
Unknown	1,267	48	0	0	
Total	$70,659	$2,867	$673	$260	
Size of Establishment					
Less than 50 employees	$36,504	$2,380	$605	$ 94	
50 to 500 employees	4,065	471	60	156	
More than 500 employees	843	16	3	10	
Unknown	29,247	0	5	0	
Total	$70,659	$2,867	$673	$260	

CAPITAL COMMITTED TO US VENTURE FUNDS, 1983-92

Share Contributed by	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92
Pension Funds	31%	34%	33%	50%	39%	46%	36%	53%	42%	42%
Foreign Sources	16	18	23	11	13	14	13	7	12	11
Corporations	12	14	12	11	11	11	20	7	4	3
Endowments	8	6	8	6	10	12	12	13	24	19
Individuals	21	15	13	12	12	8	6	11	12	11
Banks/Insurance Cos.	12	13	11	10	15	9	13	9	6	15
Total, percent	100	100	100	100	100	100	100	100	100	100
Total, $ billions	3.4	3.2	2.3	3.3	4.2	2.8	2.4	1.8	1.3	2.5

*SBDC: Small Business Development Centres; UC: University Centres; IAC: Industrial Applications Centres; TAAC: Trade Adjustment Centres

In Egypt, the Social Fund for Development (SFD), through its Enterprise Development Programme, has used tripartite arrangements with existing banks and NGOs to disburse $300 million in soft loans during the past two years. It has reportedly created 40,000 small enterprises and 225,000 jobs. Now, SFD is establishing incubators at El Mansura and Tala in the Nile delta, to help create greater value-added businesses.

In countries with sound capital markets and appropriate exit mechanisms for investors, private equity funds invest in enterprises with strong growth potential. For small early-stage businesses, problems are more complex, meaning seed capital funds must occasionally cover part of operational costs through grants from government or external donors. Funds may also need to make medium-sized investments on the order of $150,000 in enterprises with high potential, in order to cross-subsidize possible losses on smaller, riskier equity holdings under $50,000.

1.5 Management And Technical Advisory Services

Small enterprises, by virtue of their size and limited resources, lack skills in many areas such as small business management, product design, quality control, production engineering, accounting, marketing, and in accessing capital and information. The goals of technical assistance projects are, ideally, to strengthen existing small enterprises, help them grow to medium and large sizes, improve their full range of management skills, and enhance their productivity and quality through appropriate technological choices. At the same time, such projects attempt to develop institutional capabilities through continuing, sustainable programmes with financial viability and quantifiable impact in the local economy.

However, as noted, the actual results of technical assistance to SEs generally have been disappointing, both from the viewpoints of the donor and of the end-user. Few such schemes have been linked to policy reform or credit facilities. Other programmes place heavy emphasis on equipment and facilities such as common service centres and sectoral product development centres. Many others have a supply-side orientation, paying scant attention to real needs or markets. Still others are fully subsidized by the state or by donors who press no plans for the schemes becoming financially sustainable. Some are operated by NGOs, private agencies or chambers of industry. Most, however, are government-sponsored agencies run by inadequately trained and motivated staff, at times supplemented by international consultants for short periods of time.

In the search for effective support systems, the incubator is a recent entrant to the marketplace of policy ideas, and must be seen as complementing other schemes, rather than replacing them. Any resulting competition between alternative modes of assistance should serve, market-style, to improve their capacity for service.

Lessons Learned

Over the last two decades of applying technical assistance schemes for small enterprises, some general lessons have emerged. These call for a redefined set of assumptions about SE development, such as the ones outlined below. Incubators should be designed to operate in the framework of this "received wisdom," and the assessment of incubators vis-à-vis other support methods should keep what does and does not work fully in view.

1. **Building upon a known entity:** It is generally more effective to strengthen existing programmes with good track records than to build new institutions. However, building up a marginal entity may provide fewer benefits and cost significantly more than creating a new organization. Working through local chambers of commerce, associations, foundations, university groups, private corporations, and research and consultancy groups as delivery agents can expand the range of available resources, providing a more business-like ap proach to the process of development. Local structures must be legally established and the organizations properly staffed before project activities are fully underway.

2. **Local aspirations vs. donor agenda:** The culture and conditions on the demand side must take precedence over the donor's agenda. This calls for thorough surveys by local experts, and matching these experts with a properly selected, remunerated and trained management team. The success of the project depends largely on the competence and dedication of its local champion.
3. **Establishing networks of service providers:** This requires reliable information based on periodic inventories of professionals, institutions and facilities, all reviewed and accredited in their fields. This may seem controversial, if not, potentially, prohibitively expensive; however, small support teams can better serve their clientele by referrals to specialized agencies for technical advice rather than clients attempting to build a network of their own. Such services must be market-based and complement those already available.
4. **Setting modest, realistic goals:** Developing focused services for selected groups of entrepreneurs, rather than trying to do all things for all people, is critical. Combining service functions effectively and affordably is desirable, as for example, linking credit to counselling and learning in an integrated, affordable programme.
5. **Planning for financial sustainability:** Some subsidizing of entrepreneurs can be justified at the outset, provided it is administered on a timetable progressing towards full payment of fees and rents for services. Innovative financing means can be explored, such as a performance royalty (from 0.5-2%) on annual sales of client enterprises for a stipulated period (from 5-10 years). Such an approach has the potential to foster incubator independence, provided it does not sap the vigour of the client enterprises.
6. **Assessing market needs:** The entrepreneur is helped with technical assistance and credit, with accessing markets for goods, and with linking up to public sector procurement or sub-contractual arrangements with transnational corporations, based on specific needs. In a dynamic marketplace, small businesses can help themselves through interactions with each other, and with buyers, sellers, and transnationals.
7. **Monitoring:** Responsible backstopping by sponsors and executing agents is essential, based on an assessment of results obtained in key performance indicators.

1.6 Human Resources For Small Enterprise Development

Small enterprises can help develop entrepreneurial and industrial skills in the general populace. Developing such skills is, however, the major constraint fledgling entrepreneurs often face. Full capability is generally acquired on-the-job, by association with other firms and experienced people, by counselling, and by education and training. Companies and countries which invest heavily in learning in the form of university, vocational, and continuing education, develop the foundation for accelerated growth. As other policy and infrastructure building blocks come into place, the pace of the marketplace quickens, and more specialized training requirements have to be met.

While the need may seem clear for upgrading the skills of owner-managers, technicians, supervisors, and others, this is seldom a priority among the small firms themselves. A survey[19] of India's small scale industries documents that:

- Only 5.94% of the responding owners or their employees had undergone any training in the last three years.
- More than 93% of owners decided on their product line without help from government agencies or consultants, which speaks well for their self-reliance, but poorly for the credibility of the support system.
- The bulk of the respondents (90%+) did not have any quality benchmarking for their products, and apparently believed they did not require it.

[19] Stiftung, Fr. Naumann, 1993.

Owners need primarily to work on organizational and management development, technology and equipment selection, marketing, financial management, and other special skills for improved productivity and income creation. Supervisors require better managerial and personnel techniques, and technicians need special vocational skills. A survey of training for SEs in ASEAN countries indicated that 45.2% of respondents needed training in marketing, 21.3% in general and personnel management, 19.1% in production management, and 14.4% in financial management.[20]

Knowledge and experience can be acquired informally by interaction among clusters of small firms, through their associations, and through ***entrepreneur clubs***. More formal learning is available through short executive courses, workshop (action learning) programmes, in-company counselling, and custom-designed courses for inter-firm comparisons, environmental audits, quality assurance, and other special needs. CD-ROM technology and VCRs make it possible to adapt and disseminate some training packages locally at reasonable costs.

Other areas for organizational development include:

- **Entrepreneurship development:** essentially people development for creating sustainable ventures. This is different from traditional small business management training. Successful examples can be found in Quebec Province, Canada, the Entrepreneurship Development Institute-India, as well as in the UNDP-sponsored INTERMAN and EMPRETEC programmes.
- **Development of service providers:** ranging from management teams for small enterprise centres to private consultants geared toward small businesses. One effective scheme is the development of ***"barefoot consultants"*** at the Maharashtra Industrial and Technological Consultancy Corporation (MITCON), where cadres of village workers are brought periodically to MITCON for capacity-building, then go back as "franchisees" to advise rural Indian firms.

Again, training projects are generally evaluated in qualitative terms and few analyses are available on their cost-effectiveness. A World Bank study[21] on marketing and technical support systems for SMEs in Colombia, Indonesia, Japan, and the Republic of Korea, indicates that collective support by decentralized organizations (such as industry associations and chambers of commerce) is most effective in export marketing, while private channels (such as subcontractors and suppliers, and efforts of SMEs themselves) are more important for helping firms improve their technical capability.

In the final analysis, the future success of small business support, (and incubator programmes) in developing countries, depends in large measure on: solid business management training for techno-entrepreneurs, an environment that nourishes professional interaction, the provision of services needed by the market, and the training of service providers. As SEs are highly differentiated, target groups need to be identified at the outset, and their specific requirements assessed and prioritized. Training materials and courses must be specific and adapted to local conditions using proven techniques. Course logistics and specifics have to be tailored to personnel constraints, and take place either on-the-job, or near the enterprises themselves.

The motivation, experience, local familiarity, and language skills of trainers are critical to success. Linkage to a credit, industrial, and/or research institution can also be an advantage in a continuing programme, as the knowledge gained from training must usually be followed by both counselling and capital lending. Follow-up evaluation is also required so that future exercises can be improved. Finally, the best capacity-building takes place in the marketplace, with the policy support of the state, and with full involvement and interaction among small enterprises themselves.

[20] Kim, Seung Tin and Tang-Won Suh, eds., 1992.
[21] Levy, Brian, 1994.

1.7 Networking and Cooperation

When individuals and enterprises are motivated and enabled to share information and experience, the result is generally greater than the sum of its parts. In the current context of rapidly changing markets and technology, such inter-firm linkages—through local and international sub-contracting, joint ventures, franchising, industrial districts, and other collaborative arrangements—are no longer mere options, but imperatives.

National and International Interaction

Networking among small enterprises and with key players takes place at two levels: within the nation and internationally. ***Intra-country arrangements*** are through national and regional associations of small enterprises, chambers of commerce and industry, professional societies, and sectoral groupings. In the past, such non-governmental agencies were preoccupied with representing grievances to government, and agitating for their redress, as well as with lowering taxes and lobbying for provision of subsidies and concessions. Today, associations with a small enterprise orientation are becoming efficient delivery agents for training and counselling services. Donor agencies often prefer to work through such associations in assisting a large clientele, rather than working through individual private firms.

A number of networks are being implemented to meet the need for high speed, low cost, information in the search for international trade opportunities. While arrangements between entrepreneurs and traders provide an effective informal system, formal linkages are now being developed using the consulates of various countries and their chambers of commerce. ***The Trade Information Network*** (TIN) of the G77 countries will link national chambers through a variety of mechanisms, including high-speed data lines and direct satellite transmissions, connected through the use of Egypt's TRADENET system. The ***Technological Information Pilot System*** (TIPS) covers both trade and technology information. IBCCNET, of the International Chamber of Commerce, facilitates offers of trade among chambers, while BATORLINK provides an electronic bulletin board focused on the interests of the incubation community in the United States.

The increased availability of **electronic mail, or e-mail,** often dramatically enhanced by Internet access, brings state-of-the-art computer-based communications networks to the desktops of many entrepreneurs. Using these technologies, businesses in many countries can transmit basic business correspondence, overcoming the limitations of conventional voice telephone lines. The Internet provides the potential ability to reach large markets, and to share counsel and insights across the barrier of distance. For instance, some government requests for contractors' quotations are now automatically transmitted via e-mail to prospective bidders, saving time and broadening the marketplace of those vying for public sector contracts over that previously made possible through traditional publication procedures.

In other information developments, it has been estimated that 88% of the 42 small industry associations surveyed in India distribute government orders and trade inquiries, while 62% provide information on new technology developments.[22] New services are evolving to meet these needs, such as the programme developed by Brazil's SEBRAE, the Micro and Small Business Support Service, which disseminates business information through a widely scattered network of kiosks around the country.

Subcontracting exchanges are another form of inter-firm cooperation. The strength of Japan's manufacturing sector lies in its strong subcontractual networks. Three-quarters of SEs work as subcontractors, particularly in machinery, textiles, and the metal industries. The automobile industry, for instance, depends on approximately 200 primary subcontractors who, in turn, farm out business to 4,700 secondary and 31,600 tertiary subcontractors.[23] Strong vendor support over long periods helps raise quality, lower costs, and enables rapid product changes.

[22] Stifrung, Fr. Naumann, 1993.

[23] Kim, Seung Tin and Tang-Won Suh, eds., 1992.

The ***industrial district*** is an intensive clustering of a large number of small enterprises, often networked through trade associations, working in geographic proximity to one another, and usually in one sector of the economy.[24] These clusters often grow spontaneously, while local and state agencies provide common designs, and marketing and credit support. Each firm specializes in a limited function, enabling it to concentrate resources and achieve levels of product excellence.

This flexible specialization allows enterprises to respond promptly to new demands, to achieve economies of scale, and to compete, as a group, in global markets. The garment, leather, and furniture clusters in Northern Italy are renowned for their successes in this regard. The same cooperative processes also operate successfully among diamond-polishers in Surat, India, construction tool suppliers in Ceara, Brazil, and carved wooden furniture makers in Jepara, Indonesia. Small firms may cooperate vertically by sharing out various sections of the manufacturing process, drawing upon materials and design and marketing services from a local association, or large firm or support agency. Producers of the same product may also cooperate horizontally by sharing in the production of a large order. This form of local partnership, institutionally enhanced, has some common features with the small business incubator.

A development of growing interest in Europe is the creation of new economic activity as ***spin-off*** from existing units.

An example of business support and networking in rural environments is ***China's Village and Township Enterprise (VTE) programme.*** Today, 18 million VTEs, started by rural households and cooperatives, are said to employ 112 million people, and account for an astonishing half of the country's industrial output. The government provides tax incentives, subcontracting linkages for exports, and trained workers and technical improvements through its SPARK programme. At a higher technical level of business support, the government's TORCH programme—so named for its proffering "the flame of new economic growth"—has also promoted a boom in technology business incubators in China.

The defining characteristic of an ***industrial estate*** is the developing of land and real estate for multi-user, business purposes. This development, together with basic utilities (water, telephone, sewage) and infrastructure (roads, power), provides the physical space for the conduct of a manufacturing or trade business. Some of these estates such as, in Turkey, have been successful. Others are characterized by limited success as they are accessible by only a few enterprises, possess an innately urban bias, cater only to entrepreneurs with significant capital, and are often prohibitively expensive due to elaborate, perhaps unnecessary, construction. The Indian state of Kerala developed "mini" industrial estates, with reported results below expectations—this due to a shortfall attributed to managerial problems. The preliminary evaluation of rural industrial estate development in Kenya "suggested that the results have been far from satisfactory, partly due to lack of knowledge regarding the extent of policy intervention required on the demand and supply sides, and partly due to a mismatch between assistance offered and that expected by the units."[25] A number of other lessons learned from industrial estate development in India, Pakistan, Nigeria, and Puerto Rico could be applied to incubators, as well as to the major new industrial estate programmes being planned in the Palestinian Territories and elsewhere.

A variation on the industrial estate theme is the creation of 170 ***Export Processing Zones*** (EPZs) in some 60 developing countries, including the seven Special Economic Zones in China. Shenzhen provides the example of an investment-led zone, where industry has been growing at an impressive rate of around 20% annually. These EPZs, initially focused on garments and electronics assembly, require choice locations, good infrastructure, a conducive investment climate, and skilled labour at affordable wages. As economies mature, EPZs are moving

[24] United Nations, 1994.
[25] Chuta, E, and S.V. Sethuraman, 1984.

into higher-value, knowledge-based goods and services. In some areas, these zones are evolving with ***growth triangles***, linking contiguous regions of neighbouring countries. In growth triangle areas, the more industrially advanced nations provide skills, technology, and capital, while the other partner nations contribute labour, materials, and land. The East Asian region is developing a dozen such triangles, spurred on by the current political climate. In the best instances, triangles create synergy through a sharing of each country's strengths.

Effective ***networks for small enterprise support agencies*** include TECHNONET (founded in 1972 in Singapore by the International Development Research Centre, Canada), which links 12 Asian and Pacific countries through technical information, industrial extension, entrepreneurship development, and technology-sharing programmes. The Asia Pacific Centre for Technology Transfer, New Delhi, provides technological support to the full range of enterprises. In the MERCOSUR area (the Latin American equivalent of the European Common Market), Brazil's SEBRAE is now creating links among small enterprise agencies, while UNDP's EMPRETEC promotes entrepreneurship development (Box 1-5).

Box 1-5: Effective Small Enterprise Support in Brazil

Since 1990, SEBRAE—the Small Enterprise Services Company—functions as would a private entity, utilizing funds from an employee payroll tax which raises over $400 million annually. This is an interesting partnership where the state assures basic operating support, while encouraging the agency to work in business-like ways. It is supervised by a Board of Directors composed mainly of private SE associations. SEBRAE, with 96 offices in 66 cities in all states of Brazil, provides national direction with the flexibility to incorporate regional characteristics in delivering a range of services, such as business training, consultancies, marketing, subcontracting, central purchasing, export promotion, business incubators, and information services.

A good example is SEBRAE-Rio de Janeiro, which, through 110 "service points", helps 400,000 clients. It has installed an information (phone/database) centre to handle 5,000 requests a day. Each caller to the centre is interviewed and complete data from the interview is stored on computer. The focus on information and leverage with a variety of corporations and associations has helped build a large dynamic operation in just four years.

Performance Indicators	1991	1993	1995
Service points, number	18	92	117
Requests serviced, number	25,601	263,983	2,921,041
Estimated clients, number	6,400	60,000	500,000
Potential value of business deals, US $000s	28,640	73,620	1,528,135
Financing arranged, number of enterprises		3,013	27,650
Participants in training courses, number	4,600	45,312	109,482
Strategic partners	174	262	486
Agri-business, number of beneficiaries		5,000	12,850
Newly-created enterprises, number		770	3,104
Newly-created jobs, number		4,267	12,850
Third-party resources, per cent		27	56

1.8 Questioning Technical Assistance

Serious questions have recently been raised regarding the amount of job creation, innovation and economic growth really produced by small enterprises, as well as the targeting of this sector for subsidized extension services and credit arrangements. In the UK, for instance, the state spends over £100 million annually on a variety of schemes for owner-managed businesses, mainly through business links and Training and Enterprise Councils. Taxpayers and big business are now questioning the assumption that government-supported business services really work.

As national budgets shrink, the same questions are being asked in developing countries. The benefits of, for example, agricultural research and extension services can be quantified. In the industrial and services arenas, however, quantifying the benefits of programmes becomes more difficult. Factors such as the heterogeneity of small enterprises, the differentiation of outputs, and the diversity of local conditions and economic settings, call for a variety of support systems with different sponsors, objectives, delivery mechanisms, costs, and benefits.

Quantitative evaluations, it must be noted, have been made of credit programmes. Benefits derived from small enterprise loans can be partially quantified in terms of jobs created and cost per job. For instance, World Bank projects between 1989-1993 disbursed US $1.1 billion and created 382,546 jobs.[26] The average cost per job ranged from $4,000 in Asia to $9,700 in Africa. Roughly, across regions, each loan of $20,000 created five to seven jobs.

USAID studied lending to micro-enterprises and made social benefit-cost analyses.[27] A study in five Latin American countries, for instance, indicated benefit-cost percent ratios greater than one, with internal rates of return over 100 percent—making these highly successful foreign aid projects! Technical assistance linked to such credits, however, did not improve production, and added to project costs without commensurate benefits.

The rapid proliferation of business incubators the world over (one is being added each week in the US alone) is due in some measure to the dissatisfaction with existing support mechanisms. It is also due to the perception that incubators provide an integrated and affordable package of services, which enhance the chances of survival and growth of an early-stage, knowledge-based enterprise. Coupled with favourable policy, infrastructure, and the entrepreneurial climate in industrial countries, some business incubators have been very successful in reaching their goals.

Regarding developing countries, the incubator industry is only four to six years old, and most incubators are even younger. Subsequent chapters in this study make an initial assessment of their characteristics and performance, in order to provide planners a basis for informed decisions on whether to start incubator programmes, and how to enhance their impact if initiated.

[26] L. Webster, R. Riopelle, and A.M. Chidzero, 1994.
[27] Kelly, P., and D. D'Zming, 1985.

CHARACTERISTICS OF INCUBATOR PROGRAMMES

The term *incubator* literally means: a climate-controlled environment that supports the early development—sometimes saving the life—of a new-born, or unborn animal. On a farm, incubators are used to maintain eggs at the correct temperature for development and hatching. In a hospital, a foetus that is not carried to full-term may spend a few hours or weeks in an incubator to receive additional support during the critical first weeks of life. In the economic development context, incubators exist to support the transformation of selected, early-stage businesses with high potential, into self-sufficient, growing, and profitable enterprises. By reducing the risks during the early period of business formation, the incubator is intended to contribute to economic growth through sustaining new enterprises that might otherwise fail due to a lack of adequate support; creating present and future jobs, and other socio-economic benefits.

Incubators originally derive from a number of SE initiatives discussed previously. An early focus of many economic development programmes was the support of existing enterprises, concentrating on training in the essentials of business operations, often for individual entrepreneurs. Business incubators emerged in the early 1980s out of precursor small enterprise programmes developed a decade earlier (Figure 2-1).[1] This is not to suggest that science parks, industrial estates, and other arrangements have all given way to incubators, indeed they often work in parallel, albeit in different situations. The incubator concept has itself undergone a series of transformations, responding to the needs of its market.

In this chapter, incubators are characterized, and their practices regarding key topics in the countries being studied are identified. This discussion provides the context for the assessment of incubators' overall impact in the economy.

2.1 Assumptions and Context

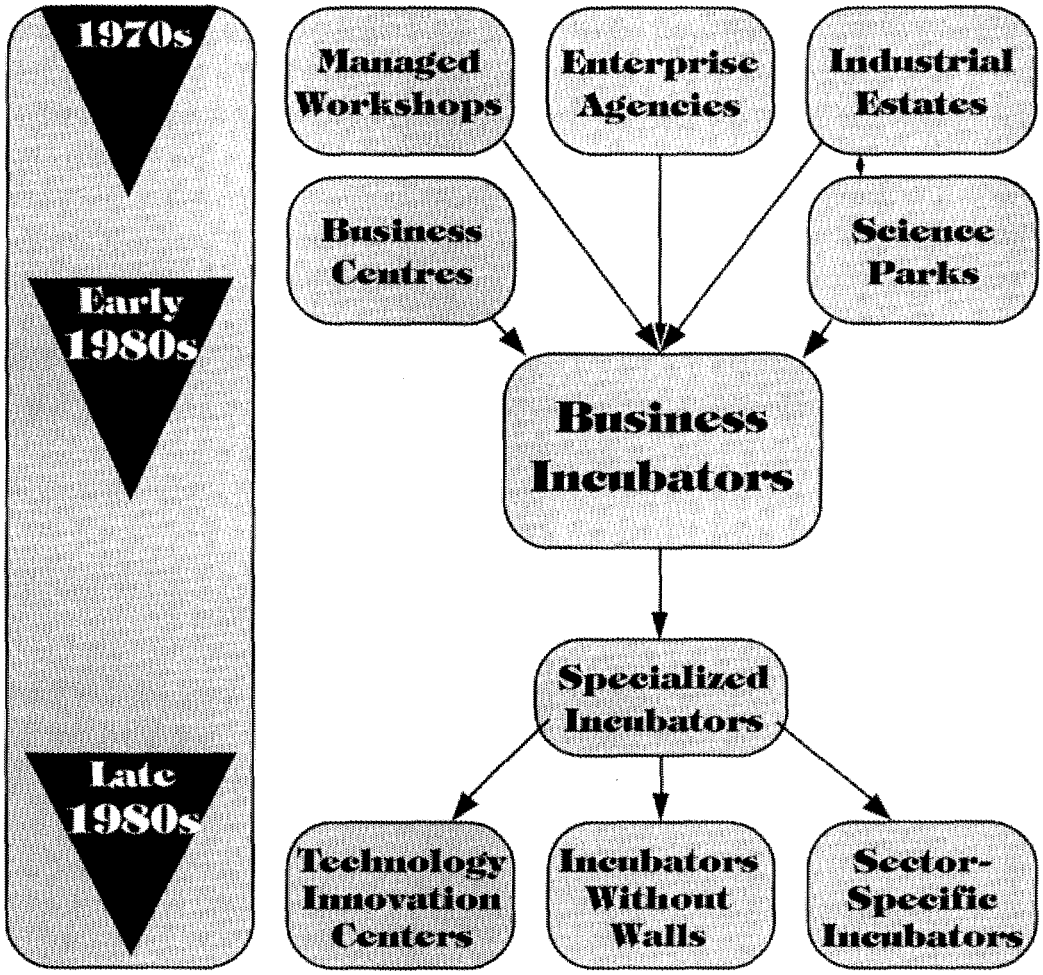
In *industrializing countries*, constraints on successful SE development include: unavailability of space for new ventures, inadequate infrastructure, incipient entrepreneurial skills, absence of a "culture of entrepreneurship," and underdeveloped networking among customers, suppliers, and businesses. A vibrant entrepreneurial sector may exist, but may be limited to individual or family operations, and then sometimes only in the retail sector. In some areas, traditional mores and a lack of infrastructure reduce opportunities for a business to grow beyond a certain size.

An incubator focuses on nurturing the process of SE development. This kind of business development requires the provision of work space and of value-adding technical and managerial support. This is however, a deceptively simple description, as incubators attempt to provide a complex range of services and features to their tenant businesses, often under difficult circumstances. While providing these services, the incubator must simultaneously juggle a number of demands, including:

- Mobilizing *Government support* through funding to initiate the concept, implement the operations plan, and cover initial operations.
- Promoting active *community participation* and private industry membership of the governing and advisory boards, and their involvement as mentors, suppliers, and customers.
- Organizing tenant support by a (usually) small, but *experienced management* staff.

[1] Adapted from Ernst & Young, 1993.

Figure 2-1: Schematic Historical Development of Business Incubators



- Implementing the *selection and graduation criteria,* because the essential feature of the incubator is the development of viable tenant businesses within a relatively short period of time.
- Ensuring the *financial sustainability* of the incubator itself.

Fiscal discipline by management is a must, to enable the incubator to survive changes in the climate of Government support, and to set a proper example for entrepreneurs in reaching sustainability themselves. While many incubators have a goal of financial self-sufficiency, some in the policy sphere would argue that the incubator is providing a service to the community, and should be subsidized indefinitely for that service.

Facilities and Services

The physical ***work space*** of incubators can be leased on a short term, initially below-market basis, to enable an entrepreneur without substantial resources to gain access to a working space. The space is furnished with the basic requirements for a business (desk, file cabinets, telephone, work area), or fitted for specific purposes, such as biotechnology (laboratory bench, chemical resistant plumbing, fume hood, hazardous waste disposal). The space generally will be vacated within a specific period of time (e.g. three years) to allow tenancy by another client-entrepreneur.

The ***facility-associated services*** can include receptionist, secretaries, conference facilities, a cafeteria, and

commonly shared items (fax, desktop publishing workstation, laser printer and copy machine). By providing a reasonably equipped workspace, the incubator provides an entrepreneur the opportunity to begin work almost immediately, offering substantial savings in fixed and working capital, in time, and an avoidance of the problems inherent in establishing an office. The presence of telephone and fax facilities can shorten the time to actually be "in business" by months, or even years, given the state of communications in some localities.

At the edge of the envelope of ***services*** are access to ***seed capital funds*** and a ***full range of professional support***, including accountants, attorneys, and consultants (business development, human resources, product design and manufacture, finance, marketing, distribution). While incubators vary in their forms of service delivery, few, if any, offer all of the services listed.

Most incubators provide ***networking***. By establishing business-to-business linkages, the incubator begins the process of bringing the isolated entrepreneur into commercial society, setting both the standards and opportunities for the development of a significant business. As another service, the incubator staff may act as a champion for the entrepreneur/tenant, espousing the quality of the product and personnel to the local business community.

An essential characteristic of incubators is the process of careful ***tenant selection***—usually 10-30 start-up and early-stage businesses for inclusion in the incubation process. Some incubators focus on entrepreneurs with specific products or manufacturing processes (e.g. software, biotechnology, agribusiness), others may target faculty and staff from a university, recruiting new business people from the ranks of academia. Most have tenants with mixed characteristics, covering a range of services and products. The application process varies in complexity from facility to facility—from a one-page form, to multi-page legal documents describing a specific contractual relationship, to requiring a complete business plan. The admissions process also varies, from an interview with a single person who can grant a decision on the spot, to a multi-stage business and technical assessment with various committee reviews and approvals.

Linked to selectivity in admission is the concept of incubation as a short term process. Therefore, the problem of successful exit or ***graduation,*** is a critical aspect of an incubator. The graduation may occur when the expansion of the business exceeds the ability of the incubator to provide physical space, or after the business reaches its development goals (perhaps agreed to as part of the admissions process), or again after a certain period of time (e.g. three years). Tenancy beyond five years raises concerns that the incubator is more of a real estate leasing venture than an economic development tool. In developing countries, the graduated business may need help with relocation as well as continuing counselling. Larger businesses in the incubator usually pay higher rents and thus help subsidize fledgling ventures in the facility.

Incubator Structure and Operations

From an operational standpoint, the challenges of an incubator are substantial. In a normal real estate development, a key anchor tenant with financial stability signs a long-term lease, thus ensuring the operating income of the venture. An incubator works in the opposite manner. Space usually is leased for short periods to a myriad of SEs sometimes possessing little or no ability to meet their financial obligations. Moreover, whereas a traditional real estate development minimizes services offered, an incubator prides itself on offering a variety of services. Key elements in incubator sustainability include the following:

Incubator manager: On the personnel side, the incubator manager is usually expected to bring the operation to a break-even point in approximately five years, all the while providing counselling and guidance to entrepreneurs. Moreover, the manager has to be an enthusiastic advocate for the tenants, possess a range of business skills, and work for nominal compensation. ***The manager, guided by a competent board of directors, is the key to the success of the incubator.***

Community: The incubation process is inexorably linked to the concept of community, as tenant-entrepreneurs

come from the local area, and are expected to graduate into leaders within its economic milieu. An essential characteristic of the incubation process is the establishment for tenants of customer, supplier, and collegial relations with appropriate members of the community. Such linkages are developed informally through networking activities, or formally through discounts on services from selected suppliers. An incubator may also mobilize experienced business professionals as mentors for the incubating businesses.

Incubator potential: The incubator offers a great potential for success, with reported 70-80% survival rates for incubated businesses, as compared to much lower survival of small businesses in general. This potential is realized not only by businesses that survive and create jobs while in the incubator, but also by those that leave and flourish. Such flourishing businesses stimulate the collateral growth and employment of both suppliers and customers.

2.2 Types of Incubators

Developing a ***theme*** for an incubator involves creating special programmes directed toward specific kinds of businesses. Incubators must develop specialized services, equipment, and management relationships to serve the targeted audience. During the past decade, a variety of themes for incubators have emerged to serve specific kinds of business needs:

1. **A targeted population** incubator enhances a conventional incubation programme with specific features to support the empowerment of specific populations, e.g. social minorities, new immigrants, women, recent graduates. Incubators being established in Africa and the Palestinian Territories are of this type.
2. ***An international incubator*** encourages foreign investment, both financial and technological. Such an incubator often includes a range of services for international and expatriate professionals. A complementary set of programmes may support the export of local manufactured goods. These programmes may emphasize appropriate design and quality standards, foreign customer credit checking, development of export documentation, and packaging.
3. **An industrial subcontracting** orientation is built on linkages to large enterprises, supporting the development of new businesses as vendors. Key features include quality control and production scheduling programmes, extending to "Just In Time" (JIT) inventory management and ISO 9000 (international manufacturing quality standards) certification.
4. ***Single business incubators*** will have programmes specifically tailored to the needs of a particular class of industrial products. Sectors have included biotechnology, computer software, metal working, handicrafts, ceramics, and agri-business.
5. **University incubators** specialize in supporting the development of businesses started by the faculty and staff of the university, or are based on some relationship to the university. Such businesses can be based on high technology licensed from the university, or on the development of processes, instruments or computer software by university personnel.
6. On a broader scale, a **technology focus** to an incubator lends cachet to the overall local or national economic development programme, providing the expectation of highly paid, environmentally friendly employment opportunities. Direct job creation from high technology businesses may actually be modest; however, the ripple effect of their actions can extend the positive range of their impact.[2] As technology business start-ups usually lack a professional reputation, an association with a university may provide a surrogate standing of sorts in the community. Technology-based enterprises too, tend to be founded by engineers and inventors who may require significant business support. Finally, such

[2] Allen, David N. and Victor Levine, 1986, p. 4.

businesses tend to incubate for a rather longer period of time, lowering the turnover in the incubator.

7. A **hub incubator**, with a full management team, can support a number of satellite incubators with a minimal staff and greater outreach possibilities. Such a hub/satellite structure can reduce operating costs and increase the impact of the incubator.
8. In recent years, the concepts of the **virtual incubator** and the **incubator without walls** have emerged. These have few resident tenants, and focus on the provision of counselling to client businesses, either through a university science department, research laboratory, or on an outreach basis to small ventures operating in their own premises. The distinction between a virtual incubator and a conventional small business counselling activity may actually be blurred in practice. This study, however, focuses on work in incubator facilities.
9. The **regional** or **rural** incubator is focused on stimulating businesses which utilize local materials and other resources, primarily serving specified geographical areas. A different set of features from urban incubators are needed to serve large rural populations, and to generate employment in that context.

Synergy between a technology incubator and technology park is clearly possible and desirable (Box 2-1). The incubator, as part of its public relations effort, can raise awareness of the park, while growing entrepreneurs into major tenants for the park. The incubator can be compensated, either directly or indirectly, for these marketing contributions, supporting its own drive for financial sustainability.[3]

The countries in this study varied widely in the type and specialization of incubators they support. The focus of the China programme is exclusively high and new technologies, driven by a close relationship with universities and research institutes. A similar, but less technologically focused relationship can be seen in Mexico, Brazil, the Czech Republic, Poland and Turkey, where several incubators have representatives from universities on their boards of directors.

2.3 Sponsors and Structure

An incubator can be distinguished from an industrial estate or from the rental of business space in a conventional multi-tenant facility through its far greater attention to the provision of business development services. Incubators have been characterized as "hotels for businesses," due to the common features of extensive services, provided together with short term, flexible use of physical property.

Incubator Partnerships and General Support

Operating structures, requiring the involvement of sponsors and friends of the incubator, raises the related issues of goals and strategic action. These issues can become disruptive unless there is an early harmonizing of divergent expectations on the part of sponsors. For instance, co-sponsorship by a state agency (looking for job creation), and by a research park (seeking high-technology tenants) can create conflict. The state may feel pressured to support high-employment, low-technology businesses, while the research park would press for tenant-generating, high-technology businesses, which often create fewer jobs.

The European Community established the Business Innovation Centres (EC BICs) as a local, comprehensive system for detection, selection, and guidance of entrepreneurs and projects. These centres create and develop new, innovative, independent businesses by offering, within a professional, cost-effective structure, a complete range of business support services. Each BIC is envisioned as a public and private partnership, involving local authorities, chambers of commerce, professional associations (industry, cooperatives, the craft sector), financial institutions, large firms and SEs, universities, research centres, and other local interest groups. Support from the EC ranges

[3] Lalkaka, Rustam and Jack Bishop, 1995.

from financial and technical assistance in the preparatory stages of business development, to financial support for building and maintaining physical facilities, operating costs, and training programmes.

Approximately half of all US incubators are supported fully by Government, while an additional quarter are funded by a combination of public and private organizations. Government assistance is usually administered by a local or state economic development agency.[4] Some 20% are sponsored by universities or community colleges, and only 8% are private, for profit. Similar structures were found in the countries targeted for this study. Sponsorship structures are outlined below for each of the countries.

Box 2-1: Malaysia—Potential Synergy Between Technology Parks and Incubators

The interaction between technology parks & incubators has potential for synergy, provided that the management and operations are meticulously planned from the start, and the sponsors have a clear understanding of their roles and responsibilities.

Malaysia Vision 2020, a Government-led development initiative, seeks to transform the country into a modern industrial society in this generation. Technology Park Malaysia (TPM), at Bukit Jalil outside Kuala Lumpur, covers over 100 acres. Starting with an initial Government investment of US $80 million, it now includes innovation –incubation– enterprise centres, a fully-equipped prototype production centre, a resource centre, and related facilities, including R&D lots.

An interim incubator in temporary facilities began operating in 1988 and had 17 tenants and 43 affiliates. Some 130 tenants are planned, which will make TPM one of the largest incubator facilities in the world. A further investment of US $88 million is approved to expand the Park to 700 acres in the next five years. TPM is entrusted with the task of assisting the development of other incubators and parks (about a dozen are now in planning and various stages of development, in collaboration with various universities). TPM is now corporatized and run like a business.

Specific measures to enhance incubator-park synergy at TPM include:

- An organizational structure linking incubator and park under one director of technology, reporting directly to the Managing Director.
- A pricing structure that expects anchor tenants to pay higher rents for R&D lots, thus partially subsidizing the younger businesses in the incubator.
- The early start of incubator operations with temporary facilities as a strategic move, giving opportunities to:
  1. pre-incubate tenants in preparation for their move to the park;
  2. improve skills of the management team through a UNDP-assisted HRD programme;
  3. enhance the image of TPM and help transform initial hostility towards the project into positive support.
- An association of parks and incubators is being formed under the same aegis.

Present indications are that the expectations regarding TPM's contribution to Malaysia's technological transformation can be met. This will be a demonstration, not only of incubator-park synergy, but also of sound leadership in developing the technology sector.

[4] National Business Incubation Association. State of the Industry Report, 1992.

Sponsors of Incubators

Brazil. Interviews suggest that Government is a necessary partner in an incubator organization. It provides essential initial operations support, while leaving project operations in the hands of the private sector. Private organizations, such as the Federation of Industrial Enterprises São Paulo (FIESP), have also been active in sponsoring business incubators.

China. The typical incubator in China features dual reporting. It is responsible both to a provincial and/or municipal science and technology committee, and to the management of the Development Zone in which the incubator is located. The TORCH programme office in Beijing provides overall guidance and organization. At the local level, there are close relationships between the incubator, universities, and research institutes. China has a programme fostering strong linkages between technology incubators and technology parks, with both of them under a single association (CASTIP), and both receiving financial support from the Government's TORCH programme.

Czech Republic. Sponsors of incubators in the Czech Republic come from several types of organizations:

- Large private companies (28%) with the aim of providing a space for their own spin-offs or eager to stimulate joint-ventures with foreign partners;
- Universities or research institutes (24%) trying to encourage the formation of science-based spin-offs and to provide basic research for incubator tenants;
- Municipal authorities (18%) with a goal of developing the private sector in the region;
- State-owned companies (18%) with the aim of enhancing the value of their land or buildings;
- Mixed groups of promoters (12%), for example, city Governments and local industrial companies.

Nigeria. Incubators were started under the Nigerian Incubator System Foundation, established (1993) as a non-profit umbrella organization. The National Implementation Committee was to execute the guidelines set by the Foundation Board. Both Board and Committee included representatives from the private sector, as well as from the federal and state Governments. Each incubator had a governing council. Under this structure, two incubators were opened and plans for a third were developed. The situation at this writing is, however, uncertain, due to the seizure of the organization by the Government in April 1995.

Mexico. While each incubator has a Board of Directors, many have added a Board of Advisors to provide additional support and counsel. The National Council for Science and Technology (CONACYT) is represented on most boards.

Poland. Since the restructuring of the economy, Poland has established a variety of incubator activities. Some seventeen facilities are now operating, with significant local and international support.

Turkey. The two incubators developed by KOSGEB (the Turkish Small and Medium-Scale Industry Development Organization) have similar organizational structures, including the Consultative Committee and the Examination and Selection Committee, in addition to the Executive Board.

Many incubators in both industrializing and industrialized countries operate as departments either of a state agency or of a university. This form generally is an expedient, but often inefficient, arrangement. A few are established as private foundations, often accepting significant Government support, at least for the design and start-up phase. This study found Governments maintaining a role in the management of many incubators. The degree of formality ranges widely, from direct ownership in Nigeria (where incubators were recently seized by the Government), to a centralized structure in China, to more broad-based forms of organization in Brazil, Mexico and Turkey.

Box 2-2: Uzbekistan—Incubators to Leverage Policy Reform

The transformation of the 70-year old command economy in Uzbekistan into a market system is a progressive, painful process. The restructuring of the old industrial regime made up of large combines into smaller, independent businesses, is encountering a variety of systemic problems. Small private businesses at the bottom of the system are challenged significantly in their attempts to operate within the law.

Two pilot incubators in Tashkent and one in Samarkand are facing the innumerable hindrances that any new business encounters, including problems with registration, taxes, banking, and trade. The programme is leveraging reforms in the policy environment. The incubators are planned to move beyond the conventional structure to become the focal points of entrepreneural activity, offering a variety of training, information, counselling, and management assistance activities, both for tenants within the facility and those outside it. Each incubator has its own managing board, while the National Coordinating Committee provides policy guidelines to the overall programme. Boards include the principal sponsors and local business. The key to incubator success is the selection, training and motivation of tenants, who often have little relevant business experience.

Three incubators started operations in mid-1995 with UNDP and UNIDO support. The Tashkent Industrial Incubator focuses on agribusiness tenants. The Tashkent Technology Incubator assists faculty, graduate students, and researchers in the state scientific laboratories with commercializing their research. The Samarkand Regional Incubator has a focus on tourism, while giving special attention to the needs of women entrepreneurs. Based on these initial results, Government is now providing an additional US $1 million to expand the programme. The state is forcing the pace of economic reform and plans 20 additional incubators in the coming years.

The challenge for incubator management lies in securing the political, and initial financial support of Government without relinquishing control. This difficult balancing act is exemplified by Uzbekistan (Box 2-2), where incubators could not open without explicit state policy intervention and finance, but may not ultimately succeed if they are viewed by the business community as agencies of the state.

2.4 Objectives And Performance

The agreement of major stakeholders upon specific, clear objectives for the incubator programme is the basis for developing overall strategy, operational tactics, and measures of performance. Poorly developed measures provide neither a standard for operation nor the basis for the evaluation of effectiveness.

Intensive evaluation frameworks may be desirable in principle, but may fail in setting goals that are sufficiently concise to be understood by stakeholders or to be readily measured. Such frameworks must set a measure of performance for the participants in the incubation process. Put simply: "The primary purpose of the incubator is to assure that the firm will become self-sustaining and move out of the incubator."[5] From the perspective of the tenant, provision of assistance in four critical areas can serve as benchmarks in assessing the success of incubation programmes: developing credibility for the business outside the incubator, training programmes which shorten the entrepreneurial learning curve, a managerial commitment to solve problems faster, and ever increasing access to local and national business networks.[6]

[5] Allen, David N. and Victor Levine, 1986, p. 189

[6] Smilor, Raymond W., and Michael Doud Gill, Jr., 1986, p. 36.

General Goals

General goals appear in one form or another in many incarnations of the incubation concept. Among these are commitments to:

Promote entrepreneurial activities that create job opportunities in areas affected by the diminished economic vitality of traditional employers;

Modernize the country's technological base through the development of advanced-technology ventures, including spin-offs from large enterprises or universities;

Support the development of sustainable economic futures for targeted groups, including rural inhabitants, women, recent immigrants, and minorities who are discriminated against.

In the context of these general goals, specific programmes have individually articulated objectives. The primary objective of many US incubators, for instance, is to promote economic development, the definition of which includes diversification of the local economy. Objectives of US incubators cover (by percentage of incubators):[7]

- Economic development, 91%
- Diversification of local economy, 61%
- Commercialization of research, 33%
- Transfer of technology, 23%
- Promote income for sponsoring organization, 20%
- Promote minority/women-owned businesses, 20%
- Neighbourhood revitalization, 12%

Measures of performance for incubators in the policy and management arenas include the following three classifications:[8]

Efficiency of incubator operations: the number of firms assisted with different services; the number of tenants in the incubator, and employees per tenant; occupancy rates; the exit rate of tenants; and evaluation of management and services by tenants.

Viability of the incubator: as per business plans and determined by projections of actual income per year; actual expenses per year; years to break-even; years to show cumulative surplus; the match of tenants to entry and exit criteria; the enhancement of real estate values; the number of graduating and failed firms over a given period of years; and evaluation of incubator effectiveness by sponsors.

Social and economic impacts: including numbers of direct and indirect jobs created by incubator tenants; the added value of tenant firms; research commercialization; the utilization of university/laboratory staff and services; specific services to disadvantaged groups; increases in the size of the tax base; the growth of regional economic activity, and evaluation by the host community to the incubator.

Objectives

National criteria and objectives follow for the assessment of incubators in the countries studied:

China. Quantifiable criteria do not exist for assessing innovation centres, since they differ (in policy terms) in the time-frames of their creation, as well as in local social and economic conditions. However, all centres share a primary objective of providing assistance to technical personnel—particularly patent holders—in the establishment of independent enterprises. The focus on "high- and new technology" provides an explicit emphasis for the national incubator programme. Based on a survey of China's innovation centres, 70% of the managers concurred with the following requirements for operating successful programmes:

- Central location in the development zone;
- Stable management team with clear division of labour and responsibility;
- Clearly defined standards for accepting enterprises as tenants and enforcing their steps toward graduation;
- Timely and accurate business and statistical reporting at the local and national levels.

The Chinese Government also expects innovation centres to: assist in the restructuring of the economy; employ scientists from institutes in the commercialization of their research; and move significant numbers of research products from the laboratory to the commercial sphere. The pursuit of these goals accounts for significant levels of municipal support, the location of most incubators in technology parks (per special zoning concessions), and the common focus on high and new technology.

Czech Republic. The primary objectives of most of the 17 Czech incubators studied are technology transfer, and the commercialization of research. These incubators also focus on creating employment and promoting regional development. The Czech Academy of Sciences has established the Technology Park, which includes a technology-oriented incubator, in order to help knowledge-intensive companies—particularly Academy spin-offs—to start and grow their businesses.

Under the centrally-planned economy, research at the Academy was strongly supported by the State. There were more than 14,000 scientists and other personnel in 1989 pursuing a basic research agenda. Immediately after the political changes that year, the budget of the Academy was cut by almost 50%, and the institution was required to transform its mission. As a result, the staff was reduced to about 6,500 and some institutes were closed. The Academy started a grant system of financial support for technological research projects, requiring scientists to compete for funding. As a part of the new policy, commercially-oriented projects were undertaken.

The establishment of the technology-oriented business incubator is intended to help commercialize academic research results. An additional benefit lies in the fact the incubator may strengthen the position of the Academy in negotiations with the State Government for continued budgetary support.

Mexico. Several entities evaluate the results of the incubation programmes; however, they lack a set of co-ordinated criteria. The inconsistency in evaluation is most evident in the differing expectations in determining what constitutes self-sufficiency. With these differences in mind, the goals of the Mexican incubation programme include:

- Fostering the entrepreneurial spirit in academic and research institutions, as well as in the local community as a whole;
- Creating new enterprises;
- Generating jobs, especially value-added jobs;
- Developing and implementing new tools for technology transfer;
- Modelling new kinds of enterprises—ecologically aware, sustainable, competitive, flexible, and strongly linked to existing networks.

To reach these goals, the following process variables are monitored to assess the activity of the incubator: number of tenants, self-sufficiency, average number of years for tenant graduation, and income of tenant companies. The contribution to linkages between academia and industry is broadly assessed by the amount of technology transfer to new companies; the number of researchers, students or teachers involved in technology-business enterprises; numbers of patents granted; and number and kind of technologies capitalized.

Nigeria. Incubators prior to nationalization had three major goals:

- Job creation: unemployed university graduates, retrenched public sector employees, retired research institute employees, retired private sector employees, and industrialists seeking to expand or diversify;
- Commercialization of research results;
- Enhancement of SE development.

The Technology Business Incubator Foundation established, in addition, the following operational guidelines:

- Provide spaces for tenant workshops and offices on a leasehold basis;
- Provide a comprehensive range of facilities and services to tenants, including business planning and enterprise counselling;
- Assist tenants in product development, research, and marketing;
- Link tenants with training to promote knowledge and enhance basic business skills;
- Create innovative new businesses and assist existing enterprises in maximizing their growth potential;
- Operate in a professional manner with the goal of financial self-sufficiency within a reasonable period;
- Win recognition as a centre of excellence by providing high quality enterprise support services on an outreach basis to nearby firms;
- Borrow money and receive grants (as capital investment) to accomplish programme objectives.

The stated commitment of the Nigerian Government to incubator development was unfortunately not matched by concomitant funding. Where the state Government stepped in to provide substantial financial support, incubator development was much quicker.

Poland. Incubator programme funding is disbursed with alternative sponsors emphasizing particular aspects of the modality. Incubators in Poland include four technology centres, some of which opened early in the decade, and 25 business incubators, which have grown rapidly in the past three years. Founded by a mix of sponsors, these incubators and centres receive favourable marks, particularly in terms of interest, prospects, and collaboration with local institutions.

Particular attention is paid to those training aspects of the incubation modality that support the economic restructuring programme in Poland, with job creation receiving significant attention as a programme goal. Almost half of the incubators participate in a unique benchmarking programme (Box 2-3).

Turkey. The incubators in Turkey adopted general goals of: supporting technology-based entrepreneurship (especially in the areas of information hardware, microelectronics, computers, telecommunications, advanced materials, biotechnology, genetic engineering, space, and aviation); enabling flexible production and automation; and responding to requests from industrialists to support university/industry co-operation. In addition, each incubator has specific tasks, a selection of which are illustrated below:

ITAS-Istanbul

- Encourage economic development, especially in the Aegean region, and create well-paying jobs;
- Stimulate new businesses employing value-adding technology;
- Follow specified criteria for tenant entry together with close monitoring, in order to lower the rate of failure;
- Become self-sufficient in five years while setting a positive example as a successful enterprise;
- Assist and develop technology parks within the region;
- Help local industry and research in new areas which play a key role in the national economy;
- Support commercial application of R&D to reduce industry's dependence on foreign sources of goods and technology.

ATAP-Ankara

- Promote entrepreneurship in selected sectors;
- Establish and grow new technology-based firms;

[6] Smilor, Raymond W., and Michael Doud Gill, Jr., 1986, p. 36.
[7] National Business Incubation Association. State of the Industry Report, 1992.

Box 2-3: Benchmarking Incubators in Poland

An analysis was developed through interviews with key personnel, site visits, funding requests submitted to the Ministry of Labour, monthly reports, and business plans. The methodology is intended to "benchmark" or compare the 11 incubators that receive funding from the Ministry. Comparisons among the incubators are made in order to establish norms for performance evaluation.

For purposes of comparison, incubators which started prior to the Ministry-funded Micro-Enterprise Development Project were treated differently than those started under the auspices of the project. June 1994 was used as the starting point of the formal benchmarking programme, with a separate set of indicators used to assess the incubation process prior to that date. Only 11 of 29 incubators are currently part of this benchmarking programme.

Primary monthly benchmarking data include: total gross space (square metres), gross space prior to June 1994, total net leasable space, net leasable space available for occupancy, income invoiced (collected) by 8 categories, expenses paid by 27 categories, net income/loss, amount of Ministry funding received, local contribution (value of facility and land, cash or cash equivalent by year, local input used for construction), population of city or town where located, number of tenants and employees, number of graduates and employees, and number of entering tenants.

The overall primary benchmarking indicators are: total and rental income per sq. metre occupied, net operating income (loss), total local inputs, non-Ministry funding as a percentage of Ministry funding, local input relative to local population, renovation investment per sq. metre, total investment per sq. metre, Ministry subsidy per gross sq. metre, Ministry operating subsidy per job created since June 1994, net leasable space, employees per occupied sq. metre, gross-to-net leasable space, Ministry investment per job created, and total investment per job created.

- Use university knowledge to solve industrial problems;
- Increase variety and diversity in the regional economy.

Not surprisingly, direct or indirect job creation is featured in many of the measures of performance. However, since the primary job creation occurs after graduation, these incubators are not yet documenting employment statistics. Managers are expected in the future to devote greater resources to assessing the impact of job creation in the economy after companies graduate.

Assessment Criteria

Against the background of the general philosophy and experience of incubator operations in the industrialized nations and elsewhere, this study explores the modality in the context of the current incubator norms and practices in the seven countries studied. The assessment criteria are as follows:

- Numbers of ventures created
- Numbers of direct jobs produced (with other indirect employment)
- Sustainability of the incubator (income in excess of expenses after the initial, start-up phase)
- Development of "entrepreneurial culture," university-industry linkages, and other semi-quantifiable benefits

These measures have to be applied at the time tenant-businesses generally graduate from the incubator (averaging approximately 3 years from date of entry), and when they have reached a certain level of maturity (potentially at least another 3 years after graduation). Other generally quantifiable concerns are the relationship of the above benefits to real costs, measured as benefit/cost ratios or as a discounted cash stream.

2.5 Operating Characteristics

While the concept of incubation appears straightforward, the implementation of the modality varies widely, depending on internal and external conditions, policies and procedures, which make incubators more, or less, effective. Available data raises questions and points up inconsistencies between goals and policies. Examples include: the crucial importance of the manager as compared to his/her relatively low level of compensation; the ostensible emphasis on a fixed graduation policy when, in fact, this is rarely practised; and the supposed reproduction of "best practices" by some incubators, without indications as to the real extent of their use, or explanation as to why these practices might be better than others.

An examination of the operating characteristics of incubators reveals the following internal areas critical to success, including: the size of the facility, the nature and amount of initial capitalization, the "build or renovate" decision, the role of the incubator staff (including the manager and associated training personnel), and tenant selection and graduation criteria. Each has a profound impact on the challenge of achieving successful operation of an incubator. This data is briefly touched upon in this chapter; see the country studies in Part Two for greater depth.

Facility Size

Small incubators have the advantage of intimacy and concentration of services. However, this does not generate the scale of operations required to cover fixed costs and achieve financial sustainability for the facility under most circumstances. ***While each situation is unique, achieving sustainability becomes more challenging as the facility falls below 2,000 sq. metres (sq.metres of gross building area).*** The most common size of US incubators is between 1,000 and 2,000 sq. metres, with newer units tending to be smaller.

There is a wide variation in the size of facilities in Europe, from over 11,000 sq. metres at Bilbao, Spain, to under 500 sq. metres at Londonderry, Northern Ireland, with an average size of about 3,500 sq. metres. Generally, administration and common areas comprise 25% of gross space in an incubator, with the balance being rentable to tenants.

Looking at specific incubators, the relationship of rentable space to the reported gross building area varies from 50-90%. The lower the net-to-gross ratio, the more difficult it is to attain financial sustainability while keeping costs to tenants within a range of market rates. When the ratio falls much below 60%, the challenge of developing financial sustainability becomes daunting.

Brazil. The Brazilian incubators vary widely, both in size (from 500 to 5,000 sq. metres) and in rentable space relative to the gross building area (from a significantly low 17% up to 85%). The average incubator consists of approximately 1,800 sq. metres of area with a net-to-gross ratio of 56%. (Table 2-1).

China. In a country the size of China, one can expect significant variations. Incubator managers address management challenges to businesses ranging in size from a single shop totalling 20 sq. metres, to facilities over 20,000 sq. metres. Of the 57 incubators providing data, the average size of 6,100 sq. metres provides a sufficient scale to attain financial sustainability, while the average net-to-gross of 63% requires the incubator to maintain high occupancy to achieve sustainability (Table 2-2).

Table 2-2: Chinese Incubator Facility Sizes

Incubator	Open	Area sq. metres Gross	Net
1 Wuhan	1987	8,000	6,600
2 Tianjin	1991	11,000	9,023
3 Harbin	1990	8,500	3,042
4 Chengdu	1989	6,200	4,600
5 Chongqing	1990	21,197	17,697
6 Chengdu Inn.Ctr.	1987	14,375	13,614
7 Shanghai Hi-Tech	1991	9,880	9,880
8 Guangzhou	1992	9,860	8,258
9 Daqing	1993	11,300	3,000
10 Beijing	1993	8,300	2,410
11 Weihai (DZ)	1990	3,950	1,883
12 Hangzhou	1991	12,220	7,100
13 Yantai	1992	1,700	200
14 Changchun	1992	15,000	7,500
15 Guilin	1989	3,222	2,000
16 Changsha	1990	1,460	1,000
17 Shijiazhuang	1991	2,500	2,300
18 Xiamen	1993	1,335	632
19 Xi'an	1993	4,000	3,850
20 Jinan	1992	295	295
21 Qingdou	1993	10,500	10,500
22 Baotou	1993	7,659	7.659
23 Suzhou	1994	4,320	3,030
24 Xinxing Shanghai	1994	2,885	1,677
25 Nanchang	1992	2,201	2,201
26 Kunming	1994	1,500	1,000
27 Baoding	1994	5,919	5,600
28 Fengtai	1994	11,389	4,653
29 Baoji	1993	6,000	3,000
30 Hengyang	1994	1,000	1,000
31 Anhui (Hefei)	1993	1,100	885

Czech Republic. The Czech incubators are generally large in area and with high ratios of net rented-to-gross space (Table 2-3).

Table 2-1: Area and Size of Brazilian Incubators

Incubator	Building Area Gross	Net	No. of Firms	Work Spaces
S. Carlos (Cedin)*	949	576	8	72
Florianópolis (Certi)	1,913	1,303	15	29-212
C. Grande (Parque-Pb)*	1,875	600	20	30
Brasília (Cdt)	950	750	21	12-32
Curtiba (Tecpar)*	1,500	600	10	35-65
Rio de Janeiro (Bio-Rio)	4,750	800	22	30-194
Itu (FIESP)590	500	10	50	
Porto Alegre (Ufrgs)	800	400	5	**
Camacari (Ceped)	3,300	2,300	20	100-1500
Crato (Urca)800	500	8	25-65	
Fortaleza (Cetrede)	6,000	1,500	12	48-100
Porto Alegre (Pmpa)	550	364	9	21-52
Recife 1,200	900	12	50	
São Paulo (FIESP)	838	480	8	60-80
São Carlos (Parque-Sc)	1,350	1000	17	22-60
Rio de Janeiro (Coppe)*	1,250	390	11	30-90
Average	1,225	600	10.5	

* specifically constructed for incubation use. ** businesses located inside university laboratories

Table 2-3: Size of Czech Republic Incubators

Incubator	Open	Rentable sq. metres	Rented
Business Innovation Centre, TU, Prague	1991	4,274	4,274
Technology Park, Sci. Acad., Prague	1993	1,020	950
Science & Tech. Ctr., Tech U, Prague	1991	1,034	1,034
Innovation Technology Centre VUK	1992	13,202	1,643
AGRIEN s.r.o., Ceske Budejovice	1992	1,200	1,100
Innovation Centre of Electric Energy	1994	1,543	630
Business Incubator, Pardubice	1993	10,759	10,387
Business Innovation Centre, Brno	1993	2,230	1,230
TEXING Brno	1993	9,531	3,749
Business Incubator PINK, Kromeriz	1991	1,200	1,200
Information & Management Centre, Ziln	1991	8,445	5,000
Technology Innovation Centre, Ostrava	1994	9,500	9,000
Technology Park INCEL, Prague	1994	23,700	22,800
Research, Development & Education Ctr.	1993	400	150
Business Innovation Centre, Plzen	1992	312	312
Centre of Technology and Education,	1993	1,000	550
Regional Innovation Centre (RIC), Dobra	1991	8,500	3,053

Table 2-4: Mexican Incubator Size

Incubator	Open	Area, sq. metres	
		Gross	Net
Ensenada	1990	2,500	1,380
Cuernavaca	1990	600	300
Querétaro	1994	200	120
Yucatán	1992	2,500	1,565
Toluca	1994	200	150
Morelos	1994	2,500	540

Nigeria. Both the size (5,000 sq. metres) and the net-to-gross ratio (71%) indicate the Lagos incubator might have been able to achieve financial sustainability had the Government not nationalized the programme. The Kano incubator, at 400 sq. metres, is at the low end of projected viability.

Poland. Incubators have been open in Poland since the early 1990s, with a significant number of these only having been open less than two years (Table 2-5). Their size ranges from small (500 sq. metres), to substantial (7,700 sq. metres).

Table 2-5: Polish Incubator Size

Incubator	Open	Area, sq. metres	
		Gross	Net
Szczecin	NA	7,700	4,900
Ozorków	1993	847	550
Lódz	1992	2,800	1,883
Gdansk	1994	500	410
Plock	NA	600	565
Warszawa	1991	1,500	960
Bielsko-Biala	NA	3,911	2,596
Elk	NA	1,000	860
Knurów	NA	4,922	3,200
Koszalin	NA	1,947	1,673
Kraków	NA	4,045	3,244
Ostzeszów	NA	2,800	2,456
Ozorków	NA	1,603	1,593
Pasiek	NA	1,958	
Radom	NA	2,650	2,690
Tomaszów Ma	NA	1,590	1,200
Zelów	NA	1,267	1,130
Zary	NA	4,000	1,440

Turkey. The typical Turkish incubator is around 1,500 sq. metres, with 50% of that space available for rental (Table 2-6). Both conditions suggest that the Turkish incubators will find significant operating challenges upon minimization of Governmental operating subsidies.

Table 2-6: Turkish Incubator Size

		Area, sq. metre	
Incubator	Open	Gross	Net
ITU-KOSGEB	1991	2,642	1,090
ODTU-KOSGEB	1992	3,250	1,362
ATAP	1995	1,458	858
ITAS	1995	1,530	494

Sources of Start-up Funding

The initial investment in an incubator is modest compared to that of a research park, or substantial if compared to the development of a training programme. The kind of social return on this investment, in terms of economic development, suggests a role either for Government or for non-profit institutions in providing financing for construction or renovation, equipment, and initial operating subsidies. The initial investment often includes the costs of establishing the incubator as well as the subsidy component for start-up operations.

China. At the initial development stage, the major funding sources for innovation centres were either the seed funds allocated by the national TORCH programme, or supporting funds from local Governments. Most centres were said to have acquired bank loans by working with local and regional authorities. Capitalized at over US $60 million, the Chinese incubator programme represents a substantial commitment to this modality in the Government's overall economic development programming (Table 2-7).

Table 2-7: Chinese Sources of Funds

	Investment	
Source	US $ millions	%
State & Local Government	27	42
Bank Loans	24	39
Others (including retained earnings)	11	15
TOTAL	62	100

Note: 8.3 yuan per US$

Mexico. The state-supported Mexican programme has committed over US $8 million to the development of the incubation modality to date (Table 2-8).

Table 2-8: Mexican Incubator Investment

	Investment, US $000s		
	Initial	Subsequent	Total
Ensenada	$280	$188	$468
Cuernavaca	164		164
Querétaro	377	12	389
Yucatán	1,266		1,266
Guadalajara	1,174		1,174
Itesm-Morelos	928		928
La Paz	1,246		1,246
Colima	815		815
Toluca	249		249
Median	$722		$470

Czech Republic: University administrations are the major source of funding for the development of two Czech Republic incubators (Table 2-9).

Table 2-9: Czech Republic Incubator Investment

Incubator	Investment, US $ '000	Source
Business Innovation Centre	2,000	Czech Technical University
	133	Programme PHARE
	30	Ministry of Economy
Technology Park	1,500	Academy of Sciences, Czech Rep.
	50	Academy of Sciences
	33	UNIDO

Nigeria. With two incubators in place and another in development prior to nationalization, the Nigerian programme represented a commitment of US $1 million.

Turkey. With apparent investments in individual incubators from US $100,000 to $1.25 million, the Turkish programme illustrates the wide range in the actual cost of programme development (Table 2-10).

Uses of Start-up Funds

Ideally, an incubator should be fully capitalized with funding allocated for a number of essential functions, including feasibility studies, business plan development, facility acquisition and renovation, equipment, and initial operating costs. Given a shortage of funds, or the incorrect assumption by management that an essential activity can be ignored or accomplished later, the incubator will suffer the consequences.

Published figures of averages for US incubator programmes do not reveal the significant variations in the cost of developing this modality. For example, the range of construction/ renovation costs begins with a modest $16 per sq. foot for the Flint, Michigan facility in the US, up to $100 per sq. foot for the Georgia Technical University Advanced Technology Development Centre. Average costs hover around $50 per sq. ft.

Table 2-10: Turkish Incubator Investment

Incubator	Investment, US$	Sponsor
MRCT	100,000	Tubitak
IT-KOSGEB	500,000	KOSGEB
SPO		181,000
(facility leased 15 yrs)		
ODTU-KOSGEB	617,304	KOSGEB
SPO		636,000
(facility leased 25 yrs)		
ITAS-SPO	236,000	86 shareholders, incl. Aegean Univ., Sept. 9 Univ., Tubitak, Izmir Municipality, Aegean Chamber of Industry, Association of Izmir Tradesmen
ATAP-SPO		17 shareholders, incl. Eskisehir Chamber of Industry,Anadolu University

China. This vast incubation system required over $60 million in investment, mostly in site construction. Fully 30% of this figure was invested in project start-up costs. The funds were mainly used for the development of office buildings, work spaces, and other expenditures relevant to the start-up period, such as administrative fees and salaries. A significant percentage of moneys loaned to the project reportedly were used to support tenant enterprises (Table 2-11).

Table 2-11: Chinese Incubator Investment

Purpose	Investment US$ millions	%
Site Construction	42	68
Project Support	17	27
Administration	3	5
TOTAL	62	100

Note: 8.3 yuan per US$.

Czech Republic. Investment at Czech Technical University, and the Technology Park of the Academy of Sciences incubators is shown in Table 2-12.

Table 2-12: Investment in Selected Czech Incubators,

	US$ THOUSANDS	
	BIC CTU	TP AS CR
Feasibility Study	$ 8,000	$ 8,500
Renovation	100,000	10,000
Equipment	30,000	25,000
Training of Management	10,000	12,000
TOTAL	$ 148,000	$ 55,500

Mexico. Mexican incubators appear to skip the business planning stage, at least as far as identifiable expenses are concerned. However, some planning activities were funded by agencies (including international donors) in ways that are not reflected in the following accounting. In the case of these incubators, operating subsidies appear to be factored in as a major initial cost of each project (Table 2-13).

Table 2-13: Mexican Incubator Start-up Investment

	US$ THOUSANDS			
	Cuernavaca	Yucatán	Colima	Toluca
Feasibility Study	8,696	5,657	12,698	2,805
Construction		226,449	206,349	
Renovation	19,420			
Equipment	10,601	20,568		12,261
Staff Training		1,317		1,338
Operating Subsidy	412,365	156,610		20,103

Nigeria. The significant expenditures in Lagos for feasibility studies certainly attracts attention, particularly relative to the costs of renovation and equipment, and in light of the modest results produced. (Table 2-14).

Table 2-14: Nigerian Incubator Start-up Investment

	US$ THOUSANDS	
	Lagos	Kano
Feasibility Study	$ 142	
Facility Acquisition	*donated*	*donated*
Renovation	750	6
Equipment	250	
Staff Training	30	
TOTAL	$ 1,172	

Build or Renovate?

The early incubators generally used vacant buildings. In recent years however, many programmes have constructed new facilities specifically for incubator purposes. Older buildings ostensibly mean lower costs, with the savings passed on to tenants in the form of cheap work space. This is not always the case however, due to the rising cost of renovation and operation. As incubators began to incorporate technology-based businesses, new buildings gave the promise of lower operating costs through appropriately designed facilities. New buildings have a certain symbolic value as well, providing visual evidence of the commitment of community leaders to the mission of the incubator. Given the realities of financing shortages and limited availability of vacant space, developing countries generally can save time and money by using existing vacant real estate. This savings has a significant effect on the viability of operations.

China. Most incubators in China appear to have occupied space specifically designed for the incubation process. These facilities tend to have large foyers which are used for trade fairs and exhibitions. While the first incubator (Wuhan) was established in space acquired from the Peoples' Liberation Army, this operation later moved to a custom-designed building.

Czech Republic. Only one of the 17 incubators is in a custom-built facility. Others are located on pre-existing premises.

Mexico. Whereas the incubators at Yucatán and Colima are new structures, the Cuernavaca and Toluca incubators occupy pre-existing space.

Nigeria. All three facilities in Nigeria were used for other functions before being designated as sites for incubators.

Turkey. All five incubators, whether currently operating or under development, are located in new buildings. The ODTU (Middle East Technical University)-KOSGEB Technology Development Centre occupies a new facility originally built for university use, and later diverted to incubation purposes.

Staffing

The manager is critical to the success of the incubation concept. While no study has been undertaken to identify the specific characteristics that make for successful management, a consensus regarding desirable traits emerges from the country study data:

- **Maturity:** providing direction and commanding respect, as well as possessing significant contacts in business, academia, and Government that can be used for the benefit of the incubator and its tenants/graduates;
- **Progressive outlook:** accepting new business ideas and providing a driving enthusiasm;
- **Government experience:** understanding the political process, and the policies of Government in support of SE development;
- **Private sector experience:** providing an understanding of the dynamics of the market, and of the requirements for beginning and operating successful businesses;
- **Academic experience:** understanding issues related to advanced technology, and a knowledge of how to work with the faculty/administration at local universities and research institutes;
- **Corporate planning experience:** including development and analysis of business strategies, tactics and plans, and with an emphasis on finance and marketing;
- **Computer literacy:** with a knowledge of basic business software packages and office information systems;
- **Communication skills:** both in the interpersonal, and publicity senses.

The manager ideally should have a competent staff of six to eight persons, whose major function is to attend to tenant needs.

China. The staff of 51 incubators tends to be young and well educated, with 53% possessing post-masters' level graduate degrees. Similarly, 35% are under 30 years of age, with another 44% between 31 and 40 years. No

staff person is over 60 years of age.

Czech Republic. The Business Innovation Centre at the Technical University, Prague has a staff of 11, with a scientist as manager. Similarly, the Technology Park at the Academy of Sciences has a staff of 10.

Mexico. The criteria for staff selection appear to be weighted toward those with experience in technology ventures, with a preponderance of the managers having an engineering background and significant professional experience. Managers are generally between 45 and 55 years of age (Table 2-15).

Table 2-15: Mexican Incubator Staff

	Staff		Manager	
	Professional	Other	Background	Age
Ensenada	3	8	Engineer	
Cuernavaca	3	1	Educator	45
Querétaro	2	2	Lawyer	50
Yucatán	2	3	Engineer	55
Guadalajara			Engineer	48
Iresm-Morelos			Engineer	
Unam			Engineer	52
La Paz	1	1	Lawyer	
Colima			Psychologist	35
Toluca			Lawyer	51
Chihuahua			Engineer	
Tamaulipas			Engineer	
Anáhuac			Engineer	

* part-time currently, anticipate full-time soon ** planned

Turkey. Engineers are primarily hired as incubator managers. Local retirees in the nearby community are tapped for their experience (Table 2-16).

Table 2-16: Turkish Incubator Staff

	Staff		Manager	
	Professional	Other	Background	Age
MRCT	1	1	Mech. Engr	
ITU-KOSGEB	4	3	Chem. Engr	retired
ODTU-KOSGEB	4	4	Mech. Engr.	37
ATAP	1*			
ITAS	3**	9	Mech. Engr.	retired

* part time currently, anticipate full time soon ** planned

On the whole, this study provides little insight into the process of recruiting managers. However the data does indicate that engineers are generally the professional of choice for incubator management, presumably because the field of engineering lies between the analytical understanding of science and the practicalities of business.

Since the concept of business incubation is fairly new, training programmes are recommended for both management and staff of incubators. Training ideally focuses on both broad and targeted topics—from general business management skills, to meeting the challenges of operating a multi-tenant real estate facility, to designing consulting services for entrepreneurial ventures. In spite of the apparent importance of training, this area appears either to be under-reported in the study data, or perceived by the incubators as being non-essential.[9]

Entry & Exit Criteria

As discussed earlier, the process of tenant enterprises gaining entry to the incubator ranges from the simple to the complex. Graduation criteria too vary from country to country, and frequently must take into consideration such issues as landlord-tenant laws and the lack of suitable work space for graduated companies outside the incubator itself in some developing countries.

Brazil. The principal criteria considered in selecting businesses for tenancy include the following:

- Analysis of the business's products and markets
- Technical viability and commercial potential of current and planned products
- Qualifications of the applicant's business team
- Prospects for financial self-sufficiency in the long-run
- Consistency of the business with the objectives of the incubator
- Little or no pollution in the manufacturing process, including noise
- No direct competition with current incubator tenants

Rather than a lease agreement, the incubator and tenant sign either a "partnership agreement" or an "incubation services agreement," which covers the provision and use of physical space, administrative infrastructure, and specialized services (mainly consulting).

Typically, a business will stay in an incubator for two to three years, depending on continuing evaluations by the incubator board. Exceptions are noted, such as the tenant for whom a court order was required to evict them after five years in the facility. Graduation practices in Brazilian incubators are indicated in Table 2-17.

The 3.6 year average graduation rate is noteworthy, with one incubator posting a 7 year tenancy plan—perhaps the appropriate time frame to get from the initial research period to commercial product availability in the biotechnology area. The graduation rate of 65% represents a significant success in the short history of the programme.

China. Innovation centres follow established criteria for both entry and exit, with graduation anticipated some three to five years after entry. Enrolment criteria include both the technical specifications of the business and the personal characteristics of the business team, among them:

- Minimum required educational level of the owner-applicant
- Business history of the applicant
- Possession of at least one high or new technology project or product, with clearly defined ownership
- Availability of capital and history of capital investment
- Completion of all necessary documentation as required by the Chinese Industry and Commerce Administration

[9] Lalkaka, Rustam and Jack Bishop, 1995.

Table 2-17: Graduation Practices in Brazilian Incubators

	Max. Years	Graduates - %	Grad. Rate - %
S. Carlos (Cedin)	3.0	11	82
Florianópolis (Certi)	5.0	8	88
C. Grande (Parque-Pb)	2.5	22	27
Brasília (Cdt)	3.0	15	53
Curtiba (Tecpar)	3.0	5	100
Rio de Janeiro (Bio-Rio)	7.0	2	100
Itu (FIESP)	2.0	10	67
Porto Alegre (Ufrgs)	5.0	0	—
Camacari (Ceped)	3.0	0	—
Crato (Urca)	3.0	0	—
Fortaleza (Cetrede)	4.0	1	100
Porto Alegre (Pmpa)	3.0	3	100
Recife (Itep)	4.0	0	—
São Paulo (FIESP)	2.0	10	80
São Carlos (Parque-Sc)	3.0	3	100
Rio de Janeiro (Coppe)	5.0	0	—
Average	*3.6*	*65%*	

The centre formulates support plans tailored to individual entrepreneurs, based on personal track record, public credibility, management capability, and goals of the enterprise. A technical feasibility study (including confirmation of ownership of intellectual properties, assessment of intangible assets, and technical verification) must be completed early in the business's tenancy. With the completion of the technical feasibility study, and a corresponding economic feasibility study, the process of financing, training, enterprise (re)structuring, and formulation of marketing strategies, can begin.

Graduation criteria are keyed to benchmarks in the business development process. A frequently cited benchmark in Chinese incubators is the development of at least one high or new technological product, often coupled with concrete prospects for further new product development.

Czech Republic. The entry criteria and results at two principal incubators are considered below:

Business Innovation Centre of the Czech Technical University (BIC CTU), Prague: This incubator receives 8-10 inquiries annually regarding tenancy. Occupancy exceeds 95%, with 19 companies in the incubator at this writing. Tenants include technology-oriented companies(11), business services (6), and traditional crafts (2). The incubator has served 30 companies since its establishment in 1991. Technological products developed have been in the areas of electronics, holography, CAD/CAM software, combustion engines, and environmental monitoring devices. Approximately 150 jobs to date have been created by this facility since 1991.

The failure rate of participating companies at BIC CTU is 10%. Three companies terminated their business activities—one joint venture was closed by the foreign (French) partner, one service company went bankrupt as a result of internal personnel problems, and one contract was terminated by the BIC because the company did not pay the rent. Operating costs (1994) were US $206,700, with 75% of this covered by charged services and rental income. A significant contribution comes from Programme PHARE (The Commission of European Communities). BIC CTU received a grant (4%) from the Ministry of Economy, Czech Republic.

Technology Park of the Academy of Sciences (TP AS CR), Prague: The incubator receives 10-15 inquiries annually. A queue of 7 companies at this writing matches admission criteria, but the incubator is presently full. Of the 10 companies in residence, 8 are technology-oriented, including 5 Academy spin-offs. Tenant industries include chemicals, waste water treatment, communication technologies, food services, and electronic devices. Approximately 60 jobs have been created since 1993.

The failure rate of participating companies is about 15%. One joint venture was closed by the foreign (British) partner, and one contract was prematurely terminated by the Technology Park due to an unacceptable change in the company's management orientation. The Technology Park had operating costs of 2 million Czech Crowns (CZK) in 1994, with 88% of this covered by assessed services, rental income, and annual membership dues in a consortium of institutes supporting the Technology Park. Membership dues are paid by 12 institutes (80,000 CZK each).

Mexico. Each incubator emphasizes different criteria in the evaluation of candidates for inclusion in the incubator. The facility at La Paz opted for the most stringent set of qualifications, such as ownership of an "innovative" product, fully completed feasibility study and business plan, and extensive committee reviews and approval processes.

Once a company is admitted to a Mexican incubator, it is monitored based on a specific set of development objectives. Such monitoring enhances the ability of incubator management to spot potential business problems and to recommend corrective actions. Tenancy averages about 3-4 years, which is consistent with the duration recommended by the national Board of Governors.

Nigeria. The impact of Nigerian incubators was limited due to the small number of clients they served. This was due to their selection process, which screened carefully regarding the potential for growth of the prospective tenant.

Turkey. Each incubator has a common basis for entry: prospective tenants must have a history of technological innovation and entrepreneurship. All businesses admitted to Turkish incubators have a technological orientation. Applicants must provide a description of the company's growth, and its upcoming projects, with approval resting on a qualitative evaluation of applicant background, financial requirements, and personal resources. Following the written application is a personal interview with the incubator manager. ODTU-KOSGEB requests that entrepreneurs present their business concept to an admissions committee. The committee judges the applicant based on technical skills and entrepreneurial talent; on the potential size of the venture if successful; the ability of the firm to employ a more qualified labour force; and the ability of the prospective tenant to sell to, buy from, or work with, the existing tenant mix.

Prior to entry, an entrepreneur must actually in law form a company to conduct research, development, manufacturing, or sales. Without such a company, removal of the enterprise from the incubator, should it fail, would be difficult. Graduation or termination criteria are, however, less well-defined than those for admission. Reflecting this, the Marmara Research Centre Technopark (MRCT) incubator works under an initial lease contract with the tenant, generally for a three-year term, with extensions possible for a 15% rent surcharge.

Income and Expenses

Brazil. With an average of 10 tenants and 6 staff per incubator, the Brazilian programme appears to be labour intensive. In three incubators, each tenant firm is served by at least one incubator staff member. Significantly, the operating costs vary widely in Brazilian incubators, from less than $1 to more than $16 per sq. metre per month (Table 2-18). As a result, the typical 1,800 sq. metre incubator in Brazil has operating costs of $101,000 per year.

Table 2-18: Brazilian Incubator Staffing and Operating Costs

Incubator	Tenants	Employees	Staff	Expense*
San Carlos (Cedin)	8	26	5	$1.80
Florianópolis (Certi)	15	128	10	7.11
C. Grande (Parque-Pb)	11	30	11	4.33
Brasilia (Cdt)	13	104	6	7.61
Curtiba (Tecpar)	8	30	6	2.17
Rio de Janeiro (Bio-Rio)	8	73	15	8.60
Itu (FIESP)	10	46	3	2.17
Porto Alegre (Ufrgs)	5	20	1	0.88
Camacari (Ceped)	12	87	4	2.17
Crato (Urca)	8	53	4	0.88
Fortaleza (Cetrede)	12	24	6	7.92
Porto Alegre (Pmpa)	6	20	8	3.68
Recife (Itep)	12	100	4	0.88
São Paulo (FIESP)	8	34	2	2.17
São Carlos (Parque-Sc)	11	40	6	6.52
Rio de Janeiro (Coppe)	12	66	7	16.30
TOTAL	159	880	100	
Average	*10*	*55*	*6*	*$4.70*

* Operating expenses, US$ per month per sq. metre

Mexico. Accounts receivable from provided services range from a modest to a significant source of income for Mexican incubators, dispelling the notion that service revenue is an unimportant contributor to financial sustainability. Moreover, such service revenues provide indications of an active outreach effort, extending the role of the incubator in supporting entrepreneurial development significantly beyond the walls of the facility (Table 2-19).

Nigeria. Renovation costs for the Kano facility are modest by most standards, while the costs of similar renovation for the Lagos facility are considered expensive.

In general, the costs of construction/renovation vary widely, and so do operating expenses. The frequent tendency toward averaging costs across incubators obscures this wide variation. A review of the above figures demonstrates the need for site-specific evaluations. Similarly, one can expect the wide variation in costs to be matched by differences in results, posing special challenges for the evaluation of the incubation modality.

Table 2-19: Mexican Incubator Income Distribution

	Source of 1994 Revenue as a Per cent of Total Revenues			
Incubator	Rental	Services	Other	Total
Ensenada	35	15	50	100
Cuernavaca	28	24	48	100
Querétaro	6	31	63	100
Yucatán	18	82	–	100
La Paz	100	–	–	100
Itsem	47	53	–	100

Note: Figures based on unrounded numbers not shown

2.6 Counselling, Training, and Other Support

The range of services provided by the staff of an incubator and by professionals in the community through the referral process, is dependent on a number of factors: the objectives of the tenants and their professional sophistication, the mission and capabilities of the incubator, and the overall availability of services in the community. While some incubators begin with basics, such as telephone, facsimile, and copier access, others start with a wide menu of services, then reduce the offerings as the business gradually becomes self-sufficient. The services typically offered in US incubators are in Table 2-20.

Table 2-20: Incubator Services in the USA[10]

Service	% Offering
Office Services	81
Business Planning	65
External Debt Financing	59
Government Grant/Loan Assistance	58
Training/Educational Programmes	52
Financial Management Assistance	51
Sales/Marketing Assistance	51
External Equity Financing	47

Brazil. More than half of the survey respondents indicated problems with the delivery of specialized services, and a lack of infrastructure. Many tenants report services and consulting are either weak or not available, especially in legal matters, accounting, financial management, marketing, training, human resources, design, and cost and quality control. Tenants with prior experience as managers were less concerned with these omissions than those without such experience.

China. The services offered by innovation centres in China are similar to those offered in other countries, both industrialized and industrializing (Table 2-21):

[10] National Business Incubation Association. State of the Industry Report, 1992.

Table 2-21: Chinese Incubator Service Programmes

Service	Rate
Space Rental, per sq. metre per month	
office	US$ 2.41-6.02
production	1.00-1.80
Personnel file archive, per person per month	2.41
Project Brokerage	10-15%
New Enterprise Enrolment	12.05-60.24%
Overhead Charge	
percent of annual trade sales	1-3%
alternative annual overhead charge	$120-1,200
Training, regulatory matters	free
other, in accordance with content and duration	market rate
Planning, consulting	free
Brokerage for inducing capital investment	free
Project assessment and application for tenancy	free
Financing guarantees	1-3%
Special requirements	market rate
Services for items in the public interest	free

Mexico. Incubators vary both in the kinds of services offered, and in whether the cost of services is included in the monthly space rental charge. Incubators in Mexico offer a wide variety of services, often bundled into the rent payment. A number of new services are currently in development. For details of services provided by each incubator in Mexico, see Chapter Eight.

Nigeria. Both the Lagos and Kano Technology Incubator Centres (TICs) established administrative and secretarial offices which provided different services, including: typing services (Lagos and Kano), photocopying (Lagos), and a conference hall (Lagos). Aba had acquired some office equipment prior to the Government seizure of Nigerian incubators. Aba's equipment is currently warehoused. The Nigerian incubators only provided minimal business support, as measured by the standards of other countries.

Turkey. Incubators in Turkey plan to provide a significantly expanded set of business development services. See Chapter Eleven.

Services offered range widely among the incubators reporting in this study—from the barest of essentials to a menu of offerings that rival any other business support service in the world, as, for example, the Chinese incubator service of guaranteeing tenant loans.

2.7 Finance For Tenants

Since an incubator is charged with the development of economically sustainable businesses, the availability of financing for tenants is essential. This necessity exists throughout the life of an enterprise, but is most critical during the early growth phases when internally generated funds are inadequate to support its further develop-

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open in 1996. Through this expansion FIESP hopes to nearly double both the number of interning companies, and the number of jobs created. These incubators are funded by the private sector channelling money through FIESP, the municipal Government, and national entities, such as the National Confederation of Industry, Euvaldo Lodi Institute, and SEBRAE.

The FIESP incubators are rooted in regional vocations and real demand for services. Tenant companies, representing traditional economic sectors as well as high-technology, stay in the incubators for two years. During a two-year tenure, incubating businesses received 400 hours of training, support and specialized consulting. These businesses post a success rate of 70%, with no failures reported among the graduates.

The goals of FIESP incubator programmes are to:

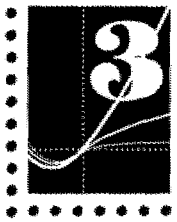
- Create conditions that increase the chances of success for manufacturing companies;
- Strengthen the local economy through the introduction of new manufacturing companies, and job creation;
- Develop entrepreneurs capable of moving with the competitive demands of the global economy;
- Promote technological innovation through information exchanges between universities, research institutes, and large companies.

Selection of entrepreneurs is based upon the financial and economic viability of the business venture; entrepreneurial spirit, honesty and integrity of the entrepreneurs, both personally and professionally; and non-polluting manufacturing processes.

According to management, the main challenges among the FIESP incubators are:

- Sensitizing the entrepreneur to the fact the incubator is a business, rather than a public assistance programme;
- Establishing partnerships with universities and research institutes to enhance technological innovation among tenants.

From the standpoint of FIESP, the role of business incubators is important, since they contribute to the development of entrepreneurs and businesses, thus creating jobs. Seeded and coordinated by the private sector, these incubators support industrial decentralization and relocation, out-sourcing, and foreign investment in small industrial enterprises.



WHAT IS THE IMPACT OF THE MODALITY?

Incubators, like other economic policy tools, face a number of conceptual and practical challenges which must be considered in any assessment of their benefits and impact. Certain benchmarks form the basis for a consideration of their effectiveness. Successful performance can be judged in two broad areas: the goal of the modality as an economic policy tool, and the effectiveness of individual programmes and institutions in developing businesses. A particular programme can fall short either in conceptual design or in implementation. It is possible to conceive macro-level policies that, for structural reasons, are not implementable. Similarly, institutional designs may be flawed, such that no amount of expertise can overcome failure.

3.1 Assessment Criteria

The approach of recent assessment exercises guides this review of the incubator modality in the economic policy arena. These exercises include the evaluations of the Trade Expansion Programme of the World Bank; assessments of incubators in four states of the US, with a closer look at the Michigan programme study results; a study of a US university incubator programme; and recent evaluations of the European incubator experience.

Trade Expansion Programme, World Bank: A background for the assessment of impact is provided by a recent study (faced with similar challenges) for the World Bank. [1]

"Four related kinds of impact were anticipated from the Trade Expansion Programme by its initiators.

1. **Direct Policy Change.** The presence of TEP missions would result in better policy analysis than would otherwise exist. The availability of better-defined and argued policy options, plus the exigencies of the process (interviews and informal discussions of the assessment team members, local reading and response to draft and final reports, the debate in seminars and face-to-face argument) would lead host Governments to adopt specific TEP recommendations.
2. **Mind Changing.** Maybe no changes would be induced directly and in the short-run by the TEP presence in a country, but the force of analysis, its independent origin, and the ensuing debate and argument would change the minds of some policy makers, officials, and intellectuals, and would help shift the balance of opinion toward more and faster reform.
3. **Intellectual Capital.** The Programme would generate new information about trade policy and better understanding of implementation problems of trade policy reform. This would percolate in donor capitals and in the developing world and gradually be reflected in improved policy-making and implementation; and
4. **Capacity Building.** Collaboration by local individuals and institutions in the preparation of reports and papers, seminars, and similar products would enhance local capacities in the design and implementation of trade policy reform.

"**Difficulty of Assessing Extent of Impact.** The problem, of course, is that it's not possible to assess the weight of these impacts in any rigorous way, much less do meaningful evaluation of cost-effectiveness. The problems of evaluations of the mind-changing and intellectual capital-creating aspects of the programme are especially intractable. Many of these effects are intangible, hence hard to seize.

"Conceptual and data difficulties also plague efforts to assess the TEP impact on policy reform on capacity

[1] United Nations Development Programme, World Bank. 1995.

building, though the fact that little of it was done simplifies the task. In fact, the earlier analysis indicates that capacity building inputs were slight and hence impacts were small, so there is no need to address that component any further."

State programmes in the US: The issues raised above indicate that the assessment of capacity-building modalities everywhere is difficult, due to ambiguity in developing an adequate evaluation plan from often incomplete data. For instance, each of the "only four systematic" incubator evaluations in the US (Ohio, Iowa, Pennsylvania, and Michigan) have been criticized as being "deeply flawed."[2]

The use of a tenant survey for the **Ohio** study provided a market-oriented evaluation but at the cost of neither reaching the mechanisms of service provision, the quality of the services, nor a cross-check for possible evaluation bias. In addition, the problems of attendant response bias were broached.

The **Iowa** evaluation compared each incubator to the needs in the local environment, but it was criticized for failing to consider alternative programmatic options. In addition, the evaluation assessed neither the use nor the quality of services, focusing on service availability. Furthermore, the evaluation included an examination neither of incubator operations nor of incubator outcomes.

The **Pennsylvania** evaluation compared incubator tenants with a group of non-incubator firms. However, flaws were alleged in the execution of the concept through the construction of the comparison group and the execution of the analysis, as well as a difference with the authors on the purposes/goals of incubators.

The **Michigan** study assessed incubator performance in terms of jobs created, incubator revenues and expenses, tenant and graduate employment, payroll, sales growth, employment growth, average cost per job created, and by firm supported. The authors' failure to offer a judgement of the effectiveness of the programme is faulted.

Several recent studies of US incubators provide a basis for establishing a set of recommended practices, based on peer-nominated "best" incubators.[3] Assessing the role of incubators as an agent of change in the US economy away from large industrial firms toward small "information age" ventures, is a challenge made all the more difficult by the differences in programmes pursued by each facility. A selective approach to SE support, based on the prior work of others argues that, "public policy has to be directed toward encouraging those few firms which have the ability to expand, and by so doing both create jobs locally and change local attitudes and aspirations. . . . Public policies which are designed to impact upon a wide variety of small businesses are doomed to failure."[4]

As of the late 1980s, US incubators were found not to turn over businesses aggressively, with only 52% leaving the incubator in the five year time frame of the study. Some 25% of these firms discontinued operations (14% of the total firms entering the incubator).[5]

Michigan Incubator Programme . The Michigan State Legislature passed Act No. 198 of the Public Acts of 1984 to: "encourage and assist in the establishment and expansion of certain small businesses within this state through the creation of business incubation centres; to provide for community boards and to prescribe their powers and duties; to prescribe the duties of the department of commerce; to prescribe the duties of, and certain benefits provided to, lessees of business incubation centres; and to make an appropriation."[6] Two surveys were administered to gather data about the effectiveness of the Michigan Incubator Programme in 1990, including a mail questionnaire to 75 incubator graduates. The major findings reported include rising average numbers of employees at graduate companies (from 4 to 6), and job creation occurring at an estimated cost of $1,600 per job.

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[2] Bearse, Peter, 1993, Appendix J-2.
[3] Rice, Mark P. and Jana B. Matthews, 1995.
[4] Tornatzky, Louis G., Yolanda Batts, Nancy E. McCrea, Marsha L. Shook, Louisa M. Quittman, 1995.
[5] Campbell, Candice, 1988, p. vi.
[6] Lyons, Thomas S., 1990.

Table 3-1: Michigan Incubator Programme

Average incubator:	age	4.8 years
	size	50,204 sq. ft.
	current tenants	282
	service businesses	nearly 1/2
Tenancy:	legal mandate	1.5 years
	actual	2.2 years
Rent:	manufacturing space	$5.16/sq ft
	non-manufacturing space	$8.61/sq ft
Location:	Urban	44%
	Suburban Town	25%
Sponsor:	University affiliated	12.5%
	For Profit	18.8%
Total graduates to date		297
	average employees on graduation	4
	average employees currently	6
	manufacturing	44%
	research & development	30%
	service	17%
	total jobs to date	63.6
	combined total sales revenues	$12,562,710
	1989 Total Payroll	$2,983,002
	Average State & Local Taxes Paid per firm	$22,340
	Survival Rate	83%
Average cost for current tenants		$1,642/job
		$7,032/firm

The survey question, "Are Michigan incubators cost-effective to the agencies/organizations that fund them?" remains unanswered. Due to small sample sizes, hesitancy both on the part of operators and graduates to answer key questions, and a limited assessment budget, the data gathered was insufficient to answer this question with any authority. It is believed however, given the available data, that Michigan incubators are cost-effective as tools for state and local economic development.

US university-sponsored incubators. Six university incubators were assessed in another study as a mechanism for supporting new technology-based firms. Performance outcomes were measured mainly from the university perspective; that is, success in promoting its mission, achievement of financial self-reliance, and changing the tenant firms's characteristics. The study suggests a variety of conclusions: a positive impact was generally reported on student entrepreneurial training and faculty involvement to help commercialize university research; however, none of the six university incubators were breaking even, and only two had the potential and determination to do so; and the incubators had generally positive impacts on tenant survival after graduation, including reported growth in sales and employment. No quantification of outcomes however, was made from this study.[7]

[7] Mian, Sarfraz. 1992.

European Business Innovation Centre Network (EBN). A study (1995) by the EBN of 86 business innovation centres determined that they launched 5,606 companies with a very low failure rate of 11.2%. In five years these incubators have created 28,000 jobs—that is, each incubator can be said to have sustained on the order of 68 firms, each with over 330 jobs. On average, each BIC had 9 staff and a high operating subsidy.

Evaluation criteria, such as cost per job, are often not wholly appropriate for incubator evaluation, since incubators are generally not pure business ventures; they are policy instruments as well. It is better to emphasize the primary employment effect of incubators through an examination of the incubated firms post-graduation. As such, the role of an incubator as a process of ***capacity building*** and ***institutional innovation***, may require measures of performance that include factors identified in Box 3-1.

Box 3-1: A Context for Evaluating Incubators

A series of incubator goals proposed here provide the context for incubator assessment. (Note: these are core goals and objectives shared by many incubators):

Goals:

- Job creation
- Foster development based upon scientific research
- Assist the economic revitalization of an area
- Promote local entrepreneurship and/or new enterprise development
- Assist the development and growth of a targeted industry
- Diversify the local economy
- Develop international trade and export potentials

Objectives:

- Help entrepreneurs develop early-stage enterprises
- Provide training or other start-up assistance to potential entrepreneurs
- Help develop new-technology-based enterprises
- Reduce the failure rate of new enterprises
- Increase the growth rate of new enterprises
- Help well-established small businesses
- Help larger businesses
- Foster commercialization of R&D
- Assist new product development
- Promote technology transfer to area businesses
- Invest in tenant firms
- Develop a network of income-sponsoring organizations
- Acquire intellectual property rights
- Facilitate fund-raising by project sponsors
- Link small businesses to larger firms (e.g. subcontracting arrangements)
- Increase local tax base
- Facilitate a "spin off" of would-be entrepreneurs from existing organizations (such as large corporations, universities and national laboratories)
- Facilitate "intrapreneurship" (entrepreneurial activity within existing organizations)
- Assist self-employment for low income people
- Improve business opportunities for minorities, the disadvantaged, youth, and women

Incubation programmes have potential to contribute to economic development, but not without concomitant risks, and not without an environment of macroeconomic and political stability. Past factors contributing to programme failure include poor implementation and monitoring by sponsors as a result of rapid turnover of accountable Government officials, and administrative instability attributable to fluctuating policies of Government ministries. For example, the accountability for the national incubator project in Nigeria shifted from the Ministry of Science and Technology, to the Ministry of Industry and Technology, and then to the reorganized Ministry of Science and Technology. Throughout this period the National Agency for Science and Engineering Infrastructures was attempting to stabilize the programme through its own managerial input. The situation resulted in predictably chaotic management. On the other hand, where strong and stable Government sponsorship is provided, as in the TORCH programme in China, incubators perform with good results.

Assessment Criteria in This Exercise

While a number of criteria for assessment of incubator programmes have been identified, they have not been used in earlier evaluations of incubator effectiveness. This first assessment of the modality in the industrializing country environment attempts to synthesize the available information, despite the newness of incubators in some countries, and the apparent lack of either local will or resources for systematic data collection on the facility and tenants. Profiles of incubators in an entire country, much less seven countries, can only give a broad impression at one point in time. Such a "snapshot" is insufficient for complete sociological assessment of the disparate dynamic processes operating in unique local environments; but it is potentially useful in illustrating the strengths and weaknesses of various programme and management approaches.

For this initial assessment, the scheme below indicates the quantifiable and non-quantifiable performance being reviewed. The following are cycles of feedback, or "loops", in which incubators operate (illustrated in Figure 3-1):

Loop 1 Enterprises created by the incubator, and their increased success rate through the incubation process, ***measured by numbers of firms incubated and number of discontinued businesses.***

Loop 2 Jobs generated in the incubator, ***measured by employment years (one job lasting one year = one employment year) through the end of year 3.***

Loop 3 Jobs and economic activity created by companies after leaving the incubator (i.e. graduates), ***measured by employment years and value-added totals or sales through the end of year 6.***

Loop 4 Public investments (subsidies) in incubator establishment and initial operations, ***measured in total investment per year.***

Loop 5 Research commercialized through product development by firms at the incubator, ***measured in numbers of projects and total economic activity (employment year + total cumulative revenues).***

Loop 6 Surveys of tenant assessment of assistance received, ***measured in response rates and evaluation of specific activities.***

Loop 7 Sustainability of the incubator, ***measured by revenue and cost performance to plan, including break-even time schedule as appropriate.***

Loop 8 Taxes and other "social" contributions by incubator tenants and graduates, ***measured by property, income, employment, and other direct tax revenues attributable to the incubator itself, tenants, and graduates.***

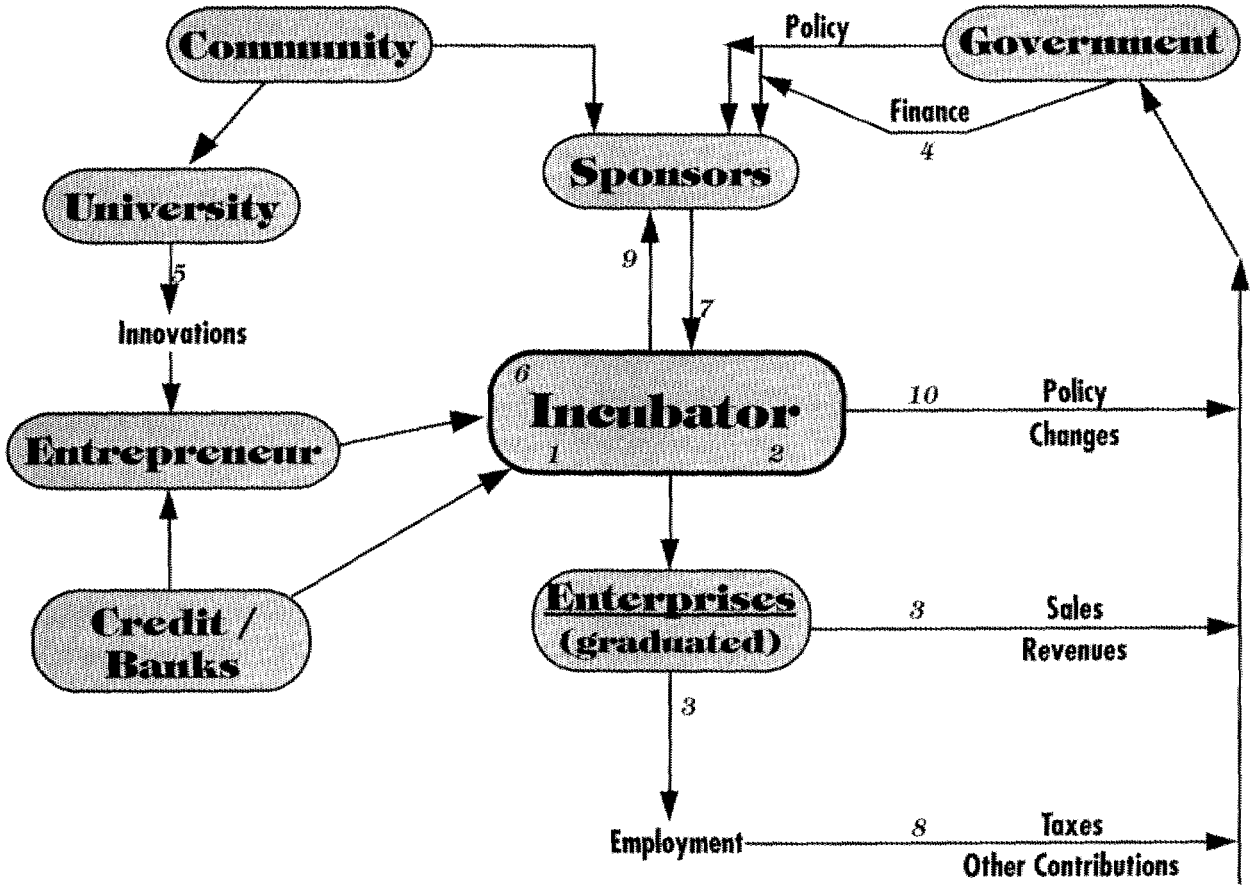
Loop 9 Capacity building, and developing the entrepreneurial "mind-set;" enhanced research-industry linkages and entrepreneurship development, ***measured by public opinion surveys, numbers of***

collaborative research contracts between industry and universities (value generated, number of faculty and staff involved).

Loop 10 Changes in state policies to enhance support for private entrepreneurial activity, *measured by numbers of policies, and financial commitment to their design and implementation.*

Clearly, only some of the above loops can be quantified in this initial review (and reality is far more complex than depicted). However, consciousness among sponsors regarding optimum incubator performance and its measurement, can be expected to result in better implementation of this, and related economic development modalities.

Figure 3-1: Incubator Assessment Overview



3.2 Enterprise Creation

China. The primary purpose of the Chinese incubator system is to support the creation of new enterprises, particularly in the area of value-adding goods and services. The ideal incubator in this system (20 tenants at "full" occupancy) should graduate 6-8 businesses annually. In practice, for a variety of reasons, fewer companies than this leave each year. The need for a greater throughput is even more important for developing countries, as financial resources are limited and the needs for enterprise and job creation are large.

The innovation centre/technology-based incubator is a new venture in China. It plays an increasingly important role in the implementation of the TORCH programme and in the development of China's high and new technology enterprises. Based on current development trends, the TORCH Programme Office is planning to increase the number of innovation centres from the current 70 to 200, anticipating more than 10,000 tenant enterprises. These centres are expected to transfer 3,000 enterprises to the national development zones in which incubators are located, generating revenues of US $4.8 billion by the year 2000. By that time, it is expected 50 enterprise groups with annual gross revenues of US $12 million will generate direct employment for 230,000 to 250,000 people.

Czech Republic. The 17 operating Czech incubators, most opening in 1993, have created a total of 440 enterprises, ranging from a low of five at one facility, to as many as 133 at the Innovation Centre of Electronics (INCEL) Technology Park. The average of 16 companies/100 jobs per incubator sustained over a two year period is considered good performance.

Mexico. The studied sample of five incubators has nurtured some 79 enterprises during the short life of the Mexican incubator programmes. Of incubating enterprises, 13 are considered successes, compared to five discontinued businesses, and another five judged as failures. The remaining 56 businesses are in the incubation process.

Nigeria. Business incubators were in an embryonic stage of development in Nigeria prior to Government nationalization. This is demonstrated by the limited number of tenants that resided in the incubators—only six in Lagos and three in Kano.

3.3 Employment Creation

Enterprises within an incubator typically grow from 1-2 persons at the start, to 10-15 at graduation. Some of the graduated companies will likely expand at rates of 20-30% a year in both sales and staff, although concrete statistics in this regard are elusive. The results from US incubators a decade ago provided figures which were characterized as "imprecise and difficult to compare. The majority of incubators created employment at a cost of $3,500 to $7,000 per job, with other impacts on the local business climate."[8] The statistics in developing countries are, if anything, less precise and equally difficult to compare.

China. Since its inception, the Tianjin incubator has created 890 jobs (or 2,653 person-years of employment).[9] With an investment (including initial operations) of 10.7 million yuan (approx. US $1.3 million), this incubator produces one job at a cost of US $1,460 each.

The Shanghai incubator produced 2,100 jobs (or 4,650 person-years of employment) in its three years of existence. With a total cost of 36.45 million yuan (approx. US $4.4 million), this incubator generates employment at a cost of $2,000 per job.

Each direct job in the incubator produces approximately one indirect job. It is also expected that companies leaving the incubator accelerate employment creation. These factors tend to reduce the calculated cost per job significantly. Thirty-two incubators opened in China between 1987 and 1993, occupying over 215,000 sq. metre of gross building area. These facilities have recorded significant increases in job creation during the 1993-94 period.

The Wuhan incubator, which began in 1987 in a converted army barracks, now has 148 tenants with a total of 2,814 employees in a specially constructed facility of 6,600 sq. metre. The originally projected results for this facility, in terms of its cost-benefit performance, have yet to be achieved. The capital investment however, is largely in place, and the cost per job created will diminish significantly in the future.

Mexico. Direct employment recorded by Mexican incubator tenants averages some 80 per facility, plus another average 40 persons as part-time employees.

[8] Campbell, Candice, 1988, p. vii.
[9] One job for one year.

Table 3-2: Employment Produced by Mexican Incubators

	Employment	
	Full Time	Part-Time
Cuernavaca	112	19
Ensenada	60	77
Queretaro	24	25
Yucatan	28	15
La Paz	245	63
Colima	13	0
TOTAL	482	199

These figures do not include the employment of graduates, the primary source of employment for incubators.

Poland. The 19 incubators surveyed reported some 283 tenant businesses in the incubator process. These firms are employing 1,670 people, or some 58 per incubator, at approximately five employees per tenant.

Turkey. With operations yet to fully reach maturity, employment totals are modest, about 34 at Istanbul Technical University (ITU)-KOSGEB, and 111 at ODTU-KOSGEB, as of this writing.

3.4 Incubators And Economic Development

This assessment study identifies some 142 incubators by name. While only half of this number provided comprehensive data, the field surveys give significant insights. The main findings regarding the modality in the overall context of economic development indicators, are summarized in this section:

Sponsors

Federal and local Government sponsors usually provide the initial investment for initiating incubator programmes, including space, equipment, and primary operating costs. Private sector involvement tends to be modest in the early stages. *Almost two-thirds of existing incubators have links to universities or research complexes due to their focus on developing technology ventures.* The Brazilian programme demonstrates a fully functioning public-private partnership, with FIESP sponsoring incubators, and SEBRAE supporting both SEs and incubators.

Enterprise Creation

The 142 reporting incubators in the study created over 3,000 new businesses, although they have been in operation for short periods. Notable successes include the seventeen incubators in the Czech Republic, having created a total of 440 new enterprises—an average of 26 companies and 100 jobs per incubator over a three year period. Overall survival rates of businesses undergoing incubation appear to be an impressive 80%.

Employment Generation

Seventy-eight of the incubators report direct employment of over 26,000 people by tenant firms. It is estimated that incubators in the aggregate have contributed on the order of 85,000 workers and managers to developing country and transitional economies.

Investment

Initial development costs for the average incubator are reportedly in the neighbourhood of US $230,000. This figure understates actual costs given that in many instances, buildings are donated, and feasibility studies, business plans, and training programmes are developed by cooperating agencies on an in-kind basis. This figure also does not usually take into consideration the operating subsidies during the first years of operation.

The major portion of initial investment is consumed by facility renovation and equipment purchases. Interestingly, of the 34 incubators giving details of initial investments, almost half did not report spending for feasibility studies. Given the apparent success of these incubators, this would indicate such studies are perhaps neither as necessary nor as effective as commonly believed!

Table 3-3: Overall Initial Investment in Incubator Development

Category	Percentage of initial investment moneys spent
Feasibility Study	5%
Facility	
Purchase	8%
Build	4%
Renovate	57%
Equipment	25%
Management & Staff Training	1%

Cost Per Job

The median incubator represented in the study developed one person-year of employment for approximately US $835. Since the jobs developed by tenant businesses appear to last more than one year, the actual cost per employment-year relative to the initial investment decreases with time. This cost per job does not factor in the related costs of affiliated programmes (Government subsidized, provided at reduced prices, or in-kind) that support tenant businesses, such as loan guarantees and outside counselling and consulting services. Therefore, this assessment is predicated on the assumption that the incubator can cover basic operations without continuing cash subsidies.

Break-even Point

Of the 24 incubators reporting operating income and expenses in the study, a median figure of US $5,000 per year in surplus revenues is indicated by the data. This figure may be misleading; however—if not masking an outright loss—given that incubator programmes provide and account differently for expenses such as equipment depreciation and contributed staff salaries as, for example, the case of affiliated university personnel who do double-duty at the incubator. If, however, this figure reflects a fair indication of revenue surplus, then the implication is that an industrializing country incubator has the potential to develop sustainable operations, perhaps in fewer years than generally believed.

Non-quantifiable Benefits

Few benefit-cost analyses of incubators, or of other SE support mechanisms, provide complete feedback to policymakers, partly because ***such analyses are not designed to capture non- or semi-quantifiable benefits.*** These benefits include: building technical and management skills in the incubator staff and tenants; commercializing university and institute research; training and developing nascent entrepreneurship potentials in businesses; enhancing university-industry relations; and persuading Governments to implement policies supporting SEs.

Benefits of Current Programmes

Overall benefits of incubator programmes, some quantifiable, some non- or semi-quantifiable, are listed below:

- **Enterprise creation:** During the short period that the 142 incubators covered in this study have been in operation, they reportedly have helped create over 3,000 new businesses across a whole range of industries. Only a small percentage of these businesses failed while interning at incubators. Incubated businesses perform and survive at higher rates when compared to the other SEs, because they are carefully selected and nurtured.
- **Employment generation:** Typically, enterprises grow from a staff of one to two at entry, to 10 to 15 in about three years. The most significant growth in employment is expected to come after graduation, when some 10% of the graduating firms can be expected to double their employment in the first three years, while another 30% grow modestly, and 50% remain the same size. Incubators in the study, on average, have generated about 335 direct jobs each.
- **Sales value:** Only minimal data has been available regarding the gross sales of tenant companies. The 2,000 companies in the Chinese programme are reported to have an output value of around 1.6 billion yuan (about US $200 million), roughly equivalent to US $100,000 per company. If these figures are matched by other incubating companies in other countries represented herein, then the modality can be said to have a significant impact on enlarging both the local economy and tax base.
- **Capacity building:** Tenant businesses and their over 26,000 personnel have, by all accounts, raised their technical and managerial skills significantly by the end of year three. At the same time, by demonstrating the venture creation process at work, other emerging entrepreneurs had successful role models to follow.
- **Technology commercialization:** Two-thirds of the incubators under study are linked to technical universities and research institutes. They have been instrumental in adapting research work and in taking an active role in its commercialization—particularly in China and the Czech Republic.
- **Cultural development:** Incubators overall are seen to have contributed positively to developments in the area of university-industry relations as well as to shaping nascent, often otherwise unsupported entrepreneurial drives in the community and society.
- Sustainability: One measure of an incubator's success and standing in the community lies in its ability to survive and expand. While time will tell whether the specific incubators studied continue to remain viable and sustainable, national incubation programmes continue to expand at rates of around 15-20% per year. This means that the current number of 250 incubators in industrializing countries could, perhaps, more than double to over 500 by the year 2000.

In the seven countries under study, the average of about 23 ventures and 82 direct jobs created per incubator in the initial years is actually on the low side of expectations. The reasons for this are manifold:

- Economic and political instability, and the resulting limits on finance and markets;
- The relative newness of the incubation concept, as many incubators have been in operation for only three years, meaning their management and their sponsors are still at the near end of the learning curve;
- In the industrialized countries, Governments recognize the cost/benefit advantage of supporting (and subsidizing) knowledge-based venture creation; in industrializing countries, Governments are not yet similarly persuaded to make such investments, given the acute nature of other needs and priorities;
- As financing is still hard to find, tenant companies are often unable to invest in their own growth, much less pay appropriate rents and fees to the incubator;

- Managers, often as a result of the above, have to spend a disproportionately large amount of time pursuing Government support to sustain operations—time which should properly be spent on serving tenants both in and outside the incubator, enhancing its image and developing creative ways of raising funds from the private sector and other sources.

China's incubator programme, however, indicates that, under special conditions, the sales generated and the employment created by incubated ventures (along with their low failure rate as businesses) can be impressive. Its track record undoubtedly gives a sound rationale for the major incubator expansion planned by the year 2000. It also provides a benchmark by which other industrializing countries can measure their policies and programmes.

An Incubator Profile

Drawing upon the experience of the seven countries in this assessment, a profile was constructed of an incubation centre in an industrializing country environment (Table 3-4). This assumes that vacant building space not requiring major renovation is available.

Table 3-4: Profile of a Projected Typical Incubator

A)	Size,	gross, sq. metre	2,500
		net rentable	1,675
		tenants, full occupancy	28
		tenants average	25
B)	Investment, incl. subsidy for initial 3 years of operation		US $500,000
	average stay in incubator		3 years
C)	Direct jobs per tenant	year 3 average	8
	per graduated company	year 6 average	16
D)	Graduated companies per year, after year 3		4-5
E)	Annual sales per typical firm	year 3	$ 70,000
		year 6	$150,000

Based on the above assumptions, the typical growth of incubated businesses, their employment and sales can be extrapolated as follows:

Table 3-5: Growth of Businesses in the Projected Typical Incubator

	Year 1	2	3	4	5	6
New entrants	5	8	10	10	10	10
Graduate companies	-	2	3	4	4	5
Terminating companies	-	-	1	2	3	4
Companies at year-end	5	11	17	21	24	25
Employment at companies in incubator	10	55	136	168	192	200
Employment at graduated companies	-	-	-	-	-	400
Sales of companies in incubator (in millions)	-	-	$ .95	-	-	$ 1.4
Sales at graduated companies (in millions)	-	-	-	-	-	$4
Investment per direct job created	-		$3,676	-	-	$2,500
Investment per employee-year	-		$2,487			$ 657

Actual performance among the best incubators may indeed be better than this projection. This projection indicates that ***at the end of year six, the incubator would have 25 enterprises on-site plus 18 graduated companies. These 43 firms would have sales of approximately $4 million and number 600 employees.*** Realistic estimates also include approximately 10 companies out of the 43 terminating operations after six years, giving an attrition rate of around 20%.

For reference, a profile of a European BIC is shown in Box 3-2. [10]

Box 3-2: Profile of a European Business Innovation Centre

The profile of an "average" European Business Innovation Centre provides another vantage on the modality from which to consider the incubators profiled in the seven industrializing countries of this study.

Average population coverage:	1.41	million
BIC staff size	9-10	
Resources (in ECU)		
Subsidies	345,624	(48%)
Revenues	372,824	(52%)
Total	718,448	
Percentage of BICs with incubators	73%	
Average incubator area	4,453	sq. metre
Average incubator population	16-17	enterprises
Employment at entry	5-6	staff
Public subsidy per job created	4,765	ECU
Average annual tax & social contribution per enterprise	50,000	ECU
Export sales per enterprise (note: average SME	28-36% 10%)	
Average subcontracting revenue	30%	
Average R&D expenditures per enterprise	240,000	ECU

Main Industries: information technology, electronics, mechanical engineering

Half of the BIC's resources are subsidized, representing over US $5,000 per job created. Benefits to the economy are viewed in terms of large tax and social contributions by each enterprise, as well as significant research conducted, and expanded subcontracting arrangements and exports.

3.5 Conclusion

The analysis of the incubator experience in the selected countries points to the following conclusions:

- The incubator has to be viewed as ***one additional modality for SE support;*** not in competition with, but as a supplement to, other modalities. The incubator has a special niche, that is, the high potential, knowl edge-based early-stage enterprise. Such enterprises offer the promise of growth and employment that may warrant the initial cost of capital and subsidized services which underlie the incubator modality.
- The complexities of making benefit/cost analyses inherent to SE support mechanisms apply equally to incubators. This analysis, however, indicates that incubators, properly designed and operated, create direct employment at costs of US $3,700 or less per job. In addition, they generate other significant benefits,

[10] Pronk, Jacques, 1995.

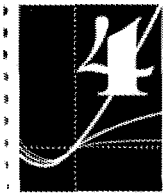
particularly after enterprises leave the incubator and achieve their full employment potential. Costs per job are significantly less when considered on an employee-year basis.

- ***The incubator is not necessarily an expensive economic development device.*** Like other SE promotion mechanisms, it needs initial Government support, but evidence indicates that a fair number of incubators can become self-sustaining when operations reach maturity in about the fourth year (as projected in UNIDO's incubator financial programme software[11]).
- Compared to other mechanisms, the ***incubator requires high-level management and consulting skills,*** which are often in short supply in industrializing economies. These intensive human resource needs are often, in practice, a barrier to the success of the modality.
- Incubators are highly flexible and ***serve effectively a wide range of economic development concerns***, from promoting high-tech ventures for export markets to creating rural enterprises for regional development.
- As a late entry in the SE development game, the ***incubator can build upon the experiences gained***, and avoid some of the mistakes made by other support systems.
- A great advantage of the incubator over other modalities is its ***mobilization of community institutions***—including universities—through networks of service providers. The incubator provides an integrated, affordable package of support, working space, and peer interaction.
- One valid observation regarding the modality is that incubators often attempt to do too much with too few resources. Another criticism, also valid, is that it ***targets support to a small select group,*** often having a marginal effect on problems of vast unemployment.
- By carefully screening entry into the facility, and ***cutting the normal business failure rate by almost half,*** significant benefits overall result for the community and for local entrepreneurs.
- ***State policy and financial support is essential*** to starting and sustaining incubators in industrializing countries.

Chapter One and the summary studies (in Part Two) outline the SE support systems in the various countries in this study. In this context, the incubator must be considered a complement to other assistance mechanisms—as one additional device in a promotional tool kit. There exist as yet few quantitative assessments of many kinds of economic support structures and their systems. In the decade since the incubator's emergence, it, too, has yet to be subjected to rigorous benefit and cost analyses in the larger social economy, over the long term.

As global competition becomes more intense in the coming years, developing countries will need to provide sophisticated professional support, especially for more risky, knowledge-based business activities. For these reasons, the global growth in numbers of incubators can be expected to continue at the rate of two new incubators per week until the end of this decade. Moreover, if properly established, the incubator appears to better address the difficulties encountered in developing countries, and to better do the work of nurturing business. Where incubator programmes can reduce under-capitalization, offset managerial inexperience, improve business planning, and focus community resources and Government assistance, they can also have significant impact in reducing the rate at which small businesses fail.

[11] Conderelli, Fabrizio, 1995.



IMPLICATIONS FOR POLICY AND RESEARCH

It can be argued that ***the task of an incubator is the support of large enterprises that happen at this moment in time to be small.*** The impact of the modality can thus be maximized by targeting support for businesses that have the potential to grow rapidly while playing a significant role as catalysts in the community.

This study begins a process of rethinking the role of business incubators in policy and research. This chapter brings together the determinants for the success (and failure) of the modality as an instrument of economic policy. Areas for future research are suggested along with recommended approaches to intra- and inter-national cooperation.

4.1 Economic Policy

This study finds evidence that the incubator is generally a useful tool for economic development, providing a basis for a number of SE support initiatives. However, incubators function best when implemented in concert with other economic policy interventions. It must also be noted that the ultimate success or failure of the modality may depend on the social/economic/ political environment in which it operates. Neither incubators nor other development modalities are so independent of their national, cultural, and policy contexts that they provide foolproof, error-free operation regardless of the situation at hand. A variety of issues are explored in this chapter, which will lay the intellectual groundwork for effective development and implementation of incubator programmes (Box 4-1).

This study documents incubators in a variety of circumstances: from those that are isolated and struggling to reach even modest levels of effectiveness, to incubators implemented as part of a coordinated economic development programme and located in a hospitable fiscal and political environment. The latter centres often demonstrate the capacity to support both small enterprise growth and development in a sustainable process. The great potential for synergy between a technology park and an associated incubator is also discussed, based on the operational results in China and elsewhere.

The incubator modality can be targeted to address particular lacunae in national development. When national aspirations call for an export-led strategy requiring value-added and knowledge-based products, the ***technology business incubator*** is the instrument of choice. Where strong university and state-sponsored research systems exist, technology incubators are also recommended, maximizing the expertise of faculty as well as commercializing research that might otherwise go unexploited. When the national strategy calls for quality products requiring collaborative ventures for domestic and foreign markets, an ***international incubator*** should be considered.

Where the main development concerns are to enhance quality and competitiveness, a national productivity centre could well become the implementing agency for a business incubator, as is now planned for the technology park at the Shenzhen Special Economic Zone in China. In countries where small business development centres are poorly utilized, converting such structures into incubator-like arrangements is a cost-saving strategy; this is currently under review as a means of cost-effectively expanding the Indonesian incubator programme. And where a 'technology culture' is to be developed, an innovation centre can be the catalyst, as planned for the new University of Technology, Jamaica.

Box 4-1: Questions for Managers and Policy Makers

1. In the overall national policy framework, how can incubators effectively serve as a complement to other small enterprise support programmes?
2. As a large percentage of incubators are sponsored either by governments or by universities, what can be done to induce the business and professional community to play more significant roles?
3. Since the management team is critical to the success of an incubator, how should the team be selected, trained, and remunerated to enhance the success of the incubator?
4. Since incubators graduate only two to four tenants annually, would a graduation period decreased to less than three years improve the effectiveness of the modality? How can graduated tenants continue to be assisted?
5. When and how should non-performing tenants be identified and removed?
6. To make a greater contribution to employment, how can the selection process be strengthened to better identify and support businesses with real growth potential?
7. To provide fiscal sustainability for the incubator, how can income be augmented to enable coverage of expenses? How can the value of benefits be enhanced to exceed costs?
8. What innovative means can be utilized to finance tenant operations?
9. What are the determinants of incubator success or failure? How can these factors be monitored and what corrective actions are appropriate?
10. How can intra-national associations, newsletters, directories and benchmarking be established and financed to support improved incubator operations? How can these and other international support systems, including "twinning" between incubators (and between tenant companies) be developed?
11. What follow-up measures are needed now to intensify and expand the assessment process begun with this project, including dissemination of results, programming regional workshops, and developing publications?
12. What research topics and their priorities should be identified to improve the overall performance of the incubation process?
13. As evidence of industrializing country incubator performance remains incomplete, what should policymakers consider in starting or expanding incubator programmes?

Trends in Incubation Systems

The national decision to establish or expand an incubator programme should be rooted in an awareness of certain trends in the modality as it is implemented globally. The discernible trends for the immediate future are:

Technology orientations for incubators will continue to be a wise investment in the global economy. Exponential change in information systems, electronics, and communications will create opportunities for small firms in developing countries. Other industries such as agri-business, textiles, and environmental technology will also benefit from these global shifts as well, growing through new hybrid techniques that blend traditional and modern manufacturing processes.

Incubators will increasingly be involved with developing better models for working with early-stage entrepreneurs in small towns and rural settings. A ***regional development*** focus of the incubator will call for strengthened, value-added services for these entrepreneurs, particularly in the areas of design, packaging, and marketing to

bring improved products based on local resources to regional and global markets.

Specially targeted incubators are increasingly the norm in many countries. These incubators deal with the problems of special populations, such as ***women entrepreneurs,*** or with particular markets, such as ***international business and exports.***

Professionalism in incubator design and operation is increasingly the norm, as programmes and facilities are forsaking ad hoc approaches for more deliberate and planned strategies. Among these strategies is the development of sustainability, benchmarking, and performance monitoring.

Second generation incubator systems will, in the future, provide more consulting services outside the incubator's walls to other local businesses as well as graduated firms.

Concerted efforts will be focused on ***pre-incubation*** of potential entrepreneurs. These will include helping the entrepreneur develop innovative concepts, rather than focusing on traditional products and services.

Some Governments, such as those of China and Malaysia, have recognized the value of incubators as a social investment. However, in a time of globally diminishing public sector spending, policymakers will increasingly have to be persuaded that incubators are a ***proper use of public funds.***

Incubators are increasingly being ***linked to universities or sited inside research parks or industrial estates.*** This arrangement creates synergy, benefiting incubators, tenants, and the affiliated institution.

Increasingly, ***post-incubation*** programmes are being developed that provide continuing support to graduated businesses. These programmes often link graduates to larger companies as suppliers.

As needs expand, incubators are developing into a ***hub and satellite configuration,*** allowing them to serve a broader section of the business community regionally. This may take the form of a franchising arrangement, where satellite offices are privately operated with guidance and packages of services provided by the hub incubator.

Finally, while the private sector has initially been indifferent to incubators in developing countries, it is clear that ***private sector corporate involvement*** is a powerful contributor to the success of the modality. Countries that successfully involve the private sector in their incubator systems have demonstrated the benefits of supporting such schemes.

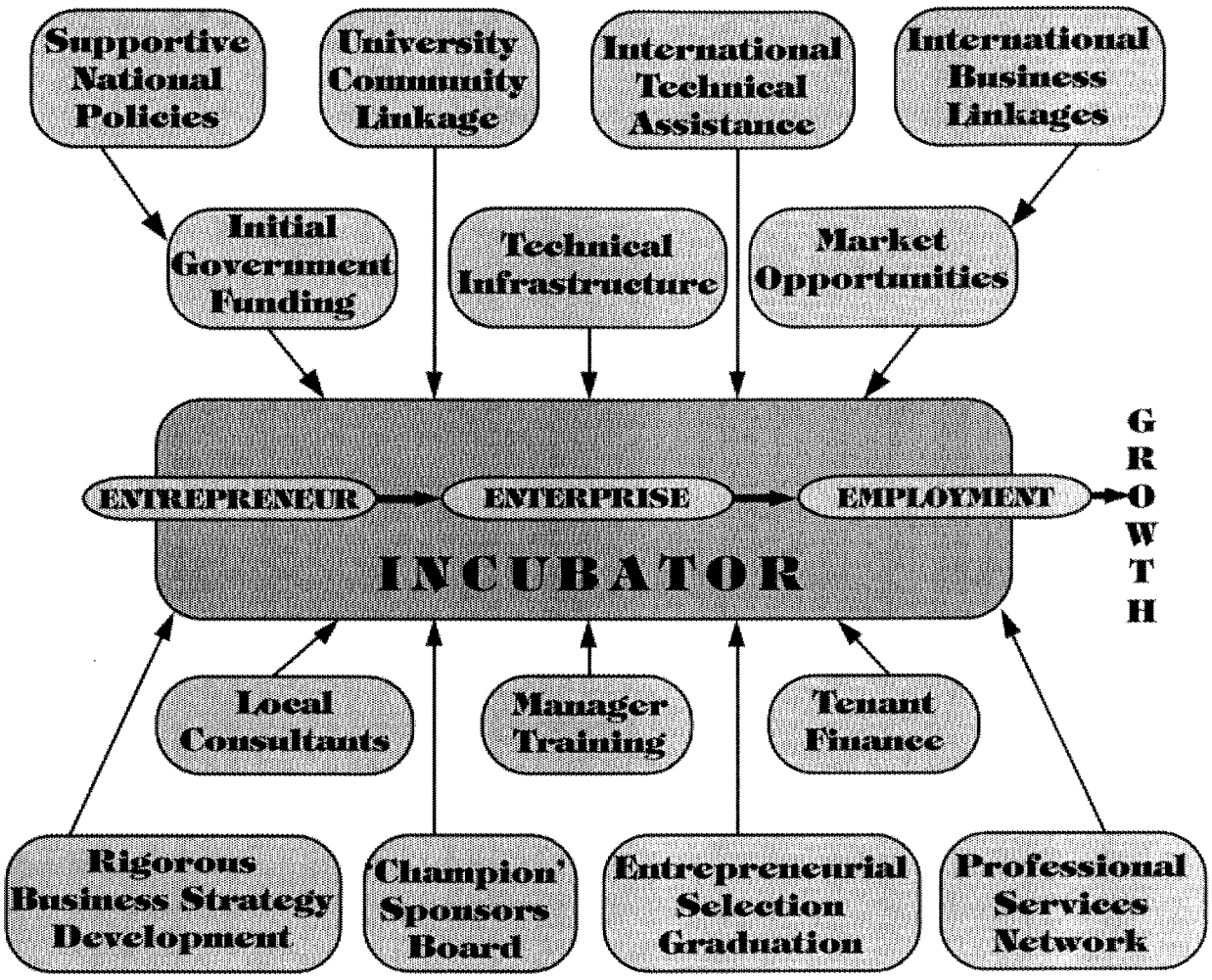
The present number of 250 incubators in developing and transition countries is expected to grow at a rate of about 20% annually. Some countries are developing entirely new incubator systems (Albania, Bulgaria, Colombia, Cote d'Ivoire, Ecuador, Egypt, Iran, Jordan, Kenya, Lebanon, Morocco, Myanmar, the Palestinian Territories, Pakistan, Romania, Senegal, Slovenia, Sri Lanka, Syria, Tanzania, Thailand, Tunisia, Zimbabwe, Viet Nam, with a number of central Asian nations strongly considering the same). Other countries with incubator systems plan expansions, as for example China, which expects to increase its incubators from 73 to 200, and Indonesia, increasing its programme from 8 to 30, both by the turn of the century.

4.2 Determinants Of Success

The literature on incubators is filled with exhaustive discussions regarding the conditions of success for the modality. A broad summary of these factors at both the micro and macro levels is summarized in Figure 4-1.[1] The review of technology business incubator projects supported by the UN Fund for Science and Technology for Development recommended more fully developed feasibility studies and business plans, as well as specific operational features, such as an international mentor programme. The study highlights factors contraindicating success, including: lack of support and commitment from ministries in charge of the project; limited competence of certain national consultants; erratic and changing priorities in mid-programme; governmental and political changes; and conflicting personal agendas of those involved with the project.[1]

[1] BADS, 1996.

Figure 4-1: Factors Supporting Incubator Success



In the US context, critical success factors have been proposed for the incubation modality, from the perspective of the incubator, including: availability of on-site business expertise, access to financing and capitalization, in-kind financial support, community support, opportunities for entrepreneurial networking, entrepreneurial education, careful selection process for tenants, and ties to a university.[2] A comprehensive review of the business incubation process provides a structure for a successful programme. From facility selection and managing the stakeholder network, to recruiting tenants, to fiscal sustainability, basic principles emerge for successful, local implementation of the incubation modality.[3]

The European Business and Innovation Centre Network (EBN) attributes the major success of its Business Innovation Centre (BIC) model in Europe to: clear mission and priorities; measurable results; definable medium- and long-term effects; complementarity; use of a cost-effective, adaptable model; and international networking.[4] Recent evaluations of pilot projects for business incubators in developing countries indicate that their success depends on the following factors:[5]

- Sponsors, both government and private, who are willing to devote time and financial resources to the

[2] Smilor, Raymond W. and Michael Doud Gill, Jr., 1986.
[3] Rice, Mark P. and Jana B. Matthews, 1995.
[4] Pronk, Jacques, 1995.
[5] Lalkaka, Rustam, 1994.

concept, as part of an overall small enterprise programme;

- Technical infrastructure, with universities and research, industrial and other professional services located nearby;
- Systematic analyses of both the real needs of entrepreneurs and all relevant costs in operating the incubator;
- Careful screening of prospective tenants;
- Proactive pursuit of business opportunities at home and abroad;
- Dedicated incubator managers who have been carefully selected, trained, and compensated;
- Access to investments in fixed and working capital for both the incubator and its tenants/graduates;
- A macroeconomic policy framework that encourages entrepreneurial activity and stimulates the market for new goods and services.

Ideally, while fulfilling these requirements for success of a pilot programme, practical lessons can be drawn from reflections on the process. Something similar is underway in Indonesia, where, based on feedback from the pilot programme, a major expansion is now planned (Box 4-2).

One lesson from this assessment is that where an entrepreneurial culture, adequate technical infrastructure, and the economic necessity to support open markets exist, the incubator industry flourishes. These conditions prevail in China, Poland, and the Czech Republic, contributing to the relative success of incubators there.

Analysis of the incubation modality does not yet support strong causal inferences, but is moving beyond the isolated case study. Emerging themes appear consistent with an analogy of the incubator as a symphony orchestra. Just as good musicians and an acoustically perfect hall are desirable, the role of a world-class conductor can be critical to the success of the performance. Similarly, evidence of incubators succeeding in relatively hostile environments leads one to believe that skilled management can compensate for the lack of affiliations with universities, research parks, and effective support networks.

Development of sustainability is desirable to overcome shifts in political support, but difficult to achieve if generation of new businesses and jobs is the exclusive initial measure of performance. A tentative hypothesis that emerges from both the current state of business incubation, and this study, refers back to a principle of venture capital investing. Success often appears risky, but is much more likely with a highly qualified and motivated entrepreneur at the helm, despite other negative factors.

4.3 Future Research

Building upon this initial incubator assessment, new avenues of investigation need to be pursued. New research will elaborate upon the current analyses, and will positively reinforce successful management with accurate feedback. Out of this study, and from the Tianjin incubator workshop, some 48 issues and questions have emerged, suggesting avenues for future research, and areas of pragmatic concern for management and programme planners. The questions follow, broken out by area of concern:

Sponsors

1. What are the available means of attracting private sector participation?
2. What is the nature and desired extent of community support?
3. What are the various roles of chambers of commerce and other associations?
4. What are the appropriate roles for universities, given their missions, and the benefits of such associations?
5. What are the roles for groups, such as "friends of the incubator" associations and entrepreneur clubs?
6. What are the desired structures and institutional presences for boards?
7. What are the implications of different forms of board governance?
8. What are the best possible legal/financial/organizational structures to employ?

Box 4-2: Indonesia's Pilot Incubator Programme

Over the last two decades, the government promoted a variety of schemes to provide credits and technical support to small businesses. While many of these received recognition in international fora, most observers feel that programmes such as LIK-PIK, Bapak-Angkat, KUK, and the mandatory lending of state enterprise profits, were not properly utilized. In 1992, BAPPENAS, through the Ministry of Cooperatives & Small Enterprises, the Private Sector Advisory Council, and UNDP technical assistance, established pilot incubators that targeted different sectors, including: technology commercialization (in Serpong), regional development (in Solo), and industrial subcontracting (in Surabaya). Out of this programme, an additional five incubators are also now operating in Java. Based on the experience of this pilot programme, the government plans an expanded national programme of about 30 business incubators by the year 2000.

The recommendations from the pilot scheme, to be incorporated into this expanded programme, encompass the following areas:

Preparation:
Creation of a strong national steering committee to guide and monitor the programme will signal support from ministries and agencies. The target clientele must be clearly defined, and preferably comprise early-stage and start-up entrepreneurs who plan businesses with rapid growth potential. Comprehensive analyses of the market for incubator services, the technical environment, community support systems and other factors form the basis of each incubator's business plan, and help mobilize full local involvement. Studies must include experience gained in the pilot programme and analyses of local institutions and culture. Also desirable is the evaluation of alternative legal structures for incubators (e.g., an incubator may start as a university department and later become a limited liability firm) to facilitate investment from private entities as the concept is proven. The private sector can serve as mentor in particular through an entrepreneurs' forum and membership in a "friends of the incubator" club.

Financial:
Funds needed for establishment and initial operations must be mobilized from the start, providing continuity and maintaining momentum. Sponsors and donors must be willing to wait a reasonable time for their investment to show results. Special procedures are recommended to enable funds from government and donor agencies to reach incubator management promptly and predictably for operational needs. Creative means must be used to generate income, e.g., royalty payments from the tenants, equity participation in tenant businesses, fees for tenant services, and barter arrangements for incubator equipment and supplies.

Operations:
After an initial period (six months or so) incubators should start charging tenants for rent and services. Traditional trades, as tenant businesses in incubators, can benefit by working under one roof, interacting with other entrepreneurs, and receiving focused help. Some 10-20 could progressively be brought into the incubator, and another 20-40 could be served on an outreach basis. Given its critical importance to incubator success, selection of managers should be based on business experience, with a full-time work requirement, continuous training, and adequate salaries and incentives based on performance.

Expectations:
For a country of Indonesia's size and potential, the plan for 30 new incubators is realistic. Expectations should be high, but also realistic.

The above lessons, derived from the Indonesian pilot incubator experience, are as applicable to starting a new incubator as they are to expanding an existing programme.

Facilities

9. What are the implications of building a new facility as compared to renovating an existing structure?
10. What is the impact of building size and relative net rentable area on incubator success and financial sustainability?
11. What are the proven mechanisms for handling occupancy and exit issues?
12. Are designated work spaces essential for successful implementation of the incubation process?
13. How can on-campus support be combined with outreach services to clients on their own premises?

Managers

14. What is the best mechanism for recruiting and remunerating managers and staff?
15. What are the most effective characteristics of an incubator manager and staff? Managers are acknowledged to be key in the success of the incubation process; however, the pay for managers and staff tends to be modest and career paths are not apparent. Research is needed to document the relationship between leadership qualities of the incubation staff and incubator success. Creativity in the design of compensation packages and career paths is a requirement for the further development of this profession.
16. What is the effectiveness of training programmes for managers and staff?

Operations Management

17. What should the goals of the incubator be and how should they be measured?
18. What are the most effective entrance policies and under what conditions is their effectiveness enhanced or diminished?
19. What are the most appropriate mechanisms for assessing the character of the entrepreneur and the business in admission to the incubation process? Instruments should be developed to guide incubator admissions committees in evaluating the quality of the business management team.
20. What are the most necessary and effective services that an incubator can offer, and how should they be funded?
21. How should tenants be monitored, and how should those who are not achieving expected potential be treated?
22. What is the benefit of focusing on a particular technological sector as compared to admitting businesses from various sectors?
23. What are the most effective graduation policies and under what conditions is their effectiveness enhanced or diminished?
24. What is the appropriate role of the incubator regarding graduated businesses?
25. What periodic monitoring, benchmarking, and reporting should be conducted on incubator operations? The effectiveness of incubators as a policy tool needs further study to determine the characteristics of either success or failure. In addition, warning signs need to be identified to signal sponsors regarding the need for intervention.

Financial Management

26. What are the critical operating costs that must be controlled for the modality to be successful?
27. What financial goals impact, either positively or negatively, the effectiveness of the incubation process?
28. Is the incubator driven by financial sustainability? When, if ever, should an incubator be allowed to remain on subsidies, or to break even?
29. Can incubators be structured as effective, for-profit organizations that deliver a return to investors consistent with other private sector investments?
30. What are alternative sources of finance for incubator start-up and operations costs?

31. What is the most effective balance of rental to service income?
32. What is the role of computer software in preparing financial plans for establishing business incubators?
33. What is the appropriate role for the incubator in assisting tenants with the financing of their businesses?
34. What payment terms should the incubator require from tenants regarding rents and services, and what actions should be taken toward specifying and acting upon delinquency?

Service Providers

35. What is the most effective way for service providers (accountants, attorneys, consultants) to work with the business incubation modality for maximum effectiveness to the provider, the incubator, and the entrepreneur?
36. What is the most effective means of the incubator developing a strong service network?
37. What is the appropriate role of incubator associations, and what are the best means of communication between associations, incubators, and tenants?

Community

38. What are the effects on the community from an (un)successful incubator?
39. What is the payoff to the local government in terms of tax revenue, both direct and indirect?
40. What are the overall, time-phased, social costs and benefits of the incubator modality?
41. What are the community associated factors that impact the effectiveness of the incubator modality?
42. What is the effect of the incubator modality in an economy in transition from planned to market oriented?
43. What is the appropriate linkage between an incubator and a university, research institute, community college, or high school?
44. What are the appropriate linkages between educational structures in industrializing and industrialized societies?

Research Modality

45. Who will do what research and when?
46. Who will sponsor/pay for research?
47. What is the data to be collected regarding communities, incubators, their tenants, and graduates?
48. What are the appropriate benchmarks for assessing the performance and impact of business incubators?

4.4 Intra-and InterNational Cooperation

The business incubator and its tenants can benefit through co-operative arrangements with other incubators at the national and international levels. In countries where both resources and time for developing successful programmes are limited, it is especially useful to exchange experiences and to learn both from the mistakes and successes of others.

National Cooperation

As incubators begin to come into operation, many participate in the creation of new arenas for interaction. Since 1992, the Mexican Association of Business Incubators and Technology Parks has been meeting to: assist existing operations and create new ones through annual conferences and training; compile and disseminate information on planned and ongoing activities; harmonize approaches to development; and influence national policies in the direction of providing more support for incubators and tenants. Similar associations are active in China and Brazil, and are currently being formed in Egypt, Malaysia, and Indonesia. In addition to greater association among incubator staff, tenant businesses also may benefit from the opportunity to mutually explore trade and technology partnerships with other tenants.

International Partnering

UNDP, through its Fund for Science and Technology for Development (UNFSTD) and the Special Unit for Technical Cooperation among Developing Countries (TCDC), has not only initiated incubator programmes in over 20 countries, but also provided opportunities for industrializing nations to meet regarding incubator issues. Past conferences have been held at Libreville, Gabon (1988); Ife, Nigeria (1990); Beijing, China (1991); Cuernavaca, Mexico (1991); and Tianjin, China (1995). The United Nations Industrial Development Organization (UNIDO) has provided significant additional assistance through its publication *Practical Guidelines for Business Incubators* and financial planning software package. A milestone event in stimulating cooperation among industrializing countries was the Inter-Regional Workshop on the Creation and Strengthening of Technology-Based Enterprises, Cuernavaca, Mexico, November 1991. The Tianjin Workshop, held September 1995, provided significant feedback regarding the incubator experience from 80 international professionals.

The most prominent arenas for interaction between industrial and industrializing countries have been the regular conferences of the National Business Incubation Association (NBIA, USA), the European Business and Innovation Centre Network (EBN, Brussels), the German Association of Technology Development Centres (ADT, Berlin), as well as the International Association of Research Parks (IASP, Spain), and the Association of University-Related Research Parks (AURRP, USA). Every year, participation from industrializing countries in all these fora has risen. These countries are also now able to access the US experience through NBIA's computer-based BATOR-LINK system, which includes a World Wide Web page on the Internet.

The twinning of industrializing country incubators with their counterparts abroad can also be an effective means of information and technology transfer. Examples include Rensselaer Polytechnic University, New York, providing staff for the Kiev, Ukraine incubator, and linkages between many of the 28 high-tech incubators in Israel and US communities. European programmes, such as the Columbus Project, helped train Latin American incubator managers. The Commission of European Communities (PHARE) provided significant assistance to Central and Eastern Europe, and the German Government helped create some 50 incubators in the former East Germany. Polish-German collaboration is extensive, comprising joint technology parks and twinned incubators. A good, in depth example of practical collaboration is the Work Group for Innovation Centres in Eastern and Central Europe (Box 4-3).

4.5 Call for Action

This analysis of the incubation experience in selected countries will ideally be carried forward and put into action. The Communiqué issued by representatives of the seven study countries and other participants at the Tianjin Workshop, September 1995, specifically called for incorporation of this study into the development and feedback systems of incubator programmes.

The measures proposed in the Tianjin Communiqué include:

- Finalization and wide dissemination of this assessment through all available channels, particularly the new associations and chambers of commerce.
- Publication of a quarterly newsletter.
- Enhancing this preliminary study with a follow-up in the same (and in other) countries, with a focus on improving the data collection for benchmarking and further analysis.
- Beginning compilation of a directory of industrializing country incubators.
- Developing memoranda of understanding with the established incubator associations, such as EBN, NBIA, and ADT, and others both South and North, for purposeful collaboration.

Box 4-3: Work Group for Innovation Centres in Eastern and Central Europe (ICECE)

ICECE is a joint initiative by representatives of technology parks, business incubation and innovation centres, and government institutions. At the first meeting of the Work Group, in conjunction with a conference of the German Association of Business and Technology Centres in Berlin, November 1991, it was decided to develop an informal network encompassing all of Central and Eastern Europe. The common goal is to provide assistance in setting up and developing technology parks and business incubators, and to support international collaboration among small and medium-sized enterprises in Central and Eastern Europe. The ICECE Work Group operates on an informal basis, encouraging the development of structures supporting interaction between East and West.

In particular, the aim of the ICECE Work Group includes the exchange of information and experience with respect to regional economic development, technology parks, business incubation centres, and the management of small and medium-sized companies from Western to Central and Eastern Europe. Development of programmes for the training of managers of such facilities, and creation of a trans-national network as a general link between existing or developing national networks, are also goals.

The membership of the ICECE Work Group is by invitation only. Each country is represented by two to four specialists from technology parks or business incubators, as well as from government institutions concerned with the promotion of entrepreneurship. In addition, selected members from Western Europe, the US, Japan, and other countries are invited to strengthen the basis for the transfer of know-how and information.

The ICECE meets in different European countries, usually in connection with other (international) conferences, to broaden the possibilities for personal contacts and information exchange. In four years ICECE met ten times and organized two international fora (Leipzig, Germany and St. Petersburg, Russia). It also published 11 issues of ICECE INFO. Organizational support is provided by the secretariats in Berlin (ADT), St. Petersburg (Baltic Technology Park), and Poznan (Polish Business and Innovation Centres Association).

- Holding regional workshops to follow-up and internalize the study's conclusions during 1996-1997 in the Arab States, Africa, Central/Eastern Europe, and Latin America and the Caribbean.
- Implementing the lessons derived from this study through improved technical assistance programmes administered through the UN development system.

4.6 Conclusions

This review of a significant number of the incubators in the industrializing world represents a bold step in the process of assessment of economic development modalities. While a consensus is apparent on the potential of the incubation process, some aspects of the modality need continuing study.

Standards of reference. The presence of a strong measurement of alternative economic policy instruments has yet to emerge as a standard for the comparison of incubators. The social benefits and costs of not readily quantifiable factors requires further characterisation and analysis.

Characterisation. The first step in assessment of incubators is their characterization. This study reveals various definitions, descriptions, and characterisations of the modality, and encourages an understanding of its costs, operations, and results in seven countries.

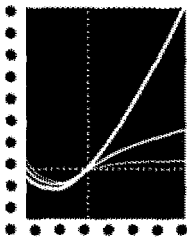
Benchmarking. With a basis for review, operating management can make reference to an evolving standard of measures to guide the performance and development of their institutions over time.

Interaction. This study also furthers a process of international cooperation in the evaluation of economic policy options, specifically at the SE level. Its best contribution may come from exposure of detailed data on individual incubators, to the peer review of the seven country consultants, to participants from 24 countries at the Tianjin Workshop, and from readers. This interaction may lead to the development of enhanced incubation theory and practice, forming a lasting contribution to economic policy.

Policy. While the assessment activity may appear to have been undertaken prematurely in the evolution of incubators, participants in the Tianjin Workshop suggested that any delay in such a study would have had a significant cost. Provisional estimates indicate that the incubation modality supports the creation, survival and growth of new enterprises and associated jobs at costs comparable with alternative modalities.

Unanswered questions. More questions were raised than answered by this review. Issues of gender, the key activities of the manager, and appropriate, if not best, operating practices need to be formally explored. This study provides a basis for structuring and dealing with emergent issues in the development of the incubation modality.

The journey of a thousand miles begins with a single step, and this study may prove to be such a step in the evolution of the incubation concept. Moving beyond individual cases, this assessment addresses several key performance variables, providing better bases for planners to consider incubation as part of a national small enterprise strategy.



Part Two
Country Studies

5 BRAZIL

5.1 Overview

Although the Brazilian incubator programme is a decade old, it continues to operate via a patchwork of public and semi-private supporting agencies. Brazil has no unified national policy regarding incubators. Recognizing that a commitment to grow the national programme was inconsistent with the realities of the current policy milieu, the Federal Government and ANPROTEC, the association representing the country's incubators, are working closely together to create a sustainable environment. The development of their strategy is rooted in the Brazilian incubator experience of the past ten years in an effort to make the modality a strong basis for SE support into the 21st century.

The first business incubator was established in Brazil in 1986. By now, there is sufficient history for an assessment of operations in the Brazilian context. In March 1995, Brazil had 42 incubators, of which 16 were studied. The main criterion for their selection was their relative maturity, that is, all incubators in the sample were created prior to the first quarter of 1993. Most of these are located in universities or research institutes, although some are managed by non-profit private organizations.

The main sources of entrepreneur-tenants in the Brazilian incubators (about 80% of the cases) are professors, students, and researchers from universities and research institutes. In second place are individuals from other companies who decided to start their own businesses.

The incubators discussed here do not include initiatives referred to as extramural incubators, virtual incubators, open incubators, or incubators without walls. This study examines those functioning exclusively as incubators, with tenants on-premises. Several types of incubators were examined, in addition to the familiar "one location, one industry, one client-base" variety. These include: uni- and multi-sectoral facilities, incubators with more than one location, and incubators that serve businesses both "in house" and externally. The kinds of incubators supported in Brazil, and the nature of Government intervention in them, is currently being formulated as part of the emerging public policy on the modality.

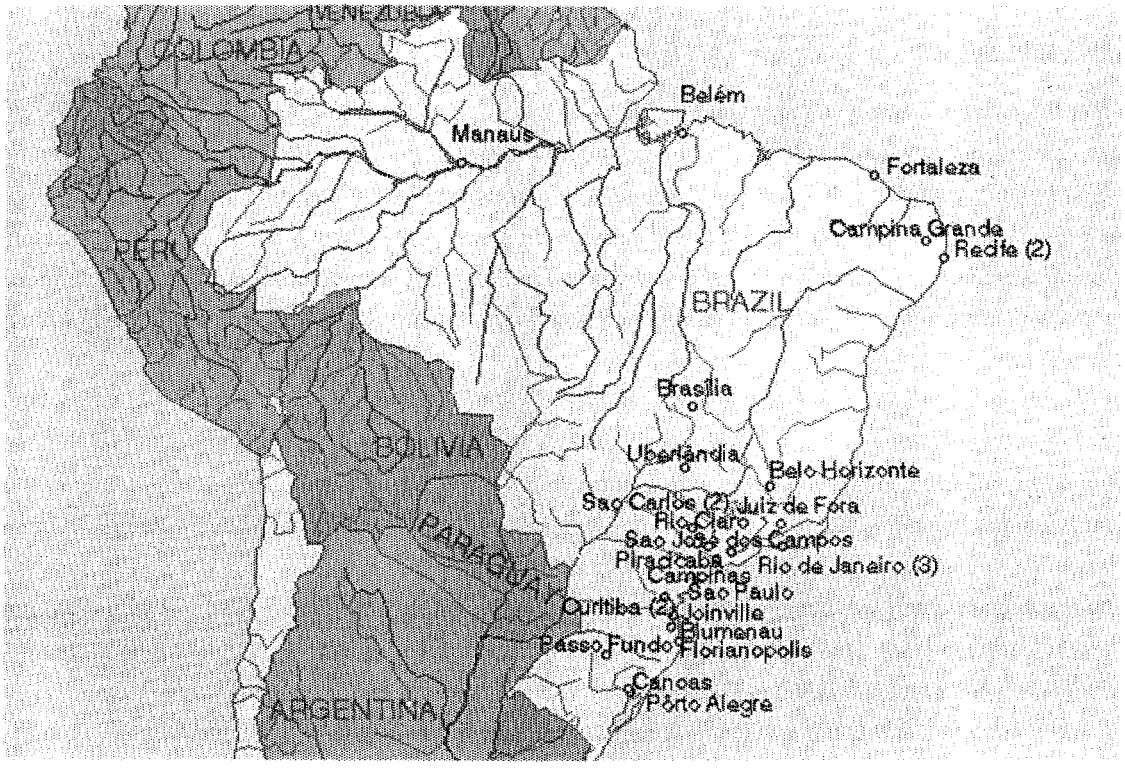
Given the existing statistical information on Brazilian incubators, it is still not possible to say conclusively that they have been a primary creator of businesses. Some important lessons however, can be learned from initiatives thus far, principally with regard to the need for stronger state support and for strengthening the interactions between universities and business. In some interviews, entrepreneurs seeking tenancy in incubators reported that the facilities provided were the decisive factor in their setting up shop. The contribution of the Micro and Small Business Support Service (SEBRAE), a public-private partnership, was also acknowledged as a critical factor in supporting small entrepreneurship.

The results achieved in the Brazilian incubators indicate that, if well organized and managed, they supported the emergence of technology-based businesses (56 % of the total), and of enterprises associated with traditional sectors of the economy (44%). Figure 5-1 and Table 5-1 show the location and date of establishment of all Brazilian incubators, while Table 1-3 lists the 16 incubators studied.

In the Brazilian experience, an incubator can have good results if it primarily organizes activities to address five concerns of the entrepreneur, namely: production, quality, cost control, distribution, and marketing. The

incubation initiative must also take into consideration the specifics of local development. Empirical evidence shows that an incubator can become a useful means of speeding up the emergence and/or consolidation of businesses.

Figure 5-1: Incubators in Brazil



Incubator Study

Following discussion of the incubators themselves, this chapter looks at the changing policy environment in which the modality functions. A survey conducted with interviews and questionnaires forms the basis of the study. Statistical analyses are not justified at this time as most Brazilian incubators were founded after 1990.

5.2 Small Enterprise Support

A variety of small enterprise support programmes are available in Brazil; these include:

Núcleos de Inovação Tecnológica (NITS) are located at nearly 15 universities or research institutions in one 40 square kilometre area. A staff of two to three was trained to assist in the transfer of technology and intellectual property.

The Entrepreneurs Club (Club de Criadores de Empresas-CRIEM) of the Science and Technology Management Programme, University of São Paulo (PACT/USP), provides entrepreneurial support from Santa Rita do Sapucaí City Hall (State of Minas Gerais), that includes finance and training programmes.

The PCDT Programme of the National Scientific and Technological Development Council (CNPq) and the **RHAE (Recourses Humanos para o Desenvolvimento Tecnológico) Programme** of the Ministry of Science and Technology, provide fellowships to both incubators and tenants (typically US $1,500 and ranging up to US $5,000). The Banco Nacional de Desenvolvimento Econômico e Social Participações (BNDESPAR) provides venture funding.

The Micro and Small Business Support Service (SEBRAE) underpins both small enterprises and incubators with an extensive package of support.

5.3 Incubators

Operations

Incubator development began slowly in the late 1980s and expanded rapidly in 1992 (Table 5-1).

Table 5-1: Incubator Development in Brazil

Year	New Incubators	Incubators in Operation
1986	1	1
1987	2	3
1988		3
1989		3
1990	3	6
1991	2	8
1992	6	14
1993	2	16
1994		16
1995	26	42

The 42 incubators functioning in Brazil represent 1,400 jobs estimated at an average of 10 businesses per incubator and five employees per business. Of the 16 incubators analyzed, three were founded before 1990. The private sector plays a significant role in the incubators studied (Table 5-2). The typical incubator has a staff of six persons and an average annual operating expense of US $56 per sq. metre.

Table 5-3: Tenants, Employees and Staff—Selected Incubators

Incubator	Tenants	Employees	Staff	Operating *
S. Carlos (Cedin)	8	26	5	$1.80
Florianópolis (Certi)	15	128	10	7.11
C. Grande (Parque-Pb)	11	30	11	4.33
Brasília (Cdt)	13	104	6	7.61
Curitiba (Tecpar)	8	30	6	2.17
Rio de Janeiro (Bio-Rio)	8	73	15	8.60
Itu (Fiesp)	10	46	3	2.17
Porto Alegre (Ufrgs)	5	20	1	0.88
Camaçari (Ceped)	12	87	4	2.17
Crato (Urca)	8	53	4	0.88
Fortaleza (Cetrede)	12	24	6	7.92
Porto Alegre (Pmpa)	6	20	8	3.68
Recife (Itep)	12	100	4	0.88
São Paulo (Fiesp)	8	34	2	2.17
São Carlos (Parque-Sc)	11	40	6	6.52
Rio de Janeiro (Coppe)	12	66	7	16.30
TOTAL	159	880	100	
Average	10	55	6	$4.70

* Operating expenses, US$ per month per square metre

Table 5-2: Incubator Management in Brazil

Incubator	Municipality	Year	Management
Brasília	Federal District	1990	Centro de Apoio ao Desenvolvimento Technológico, CDT
Camaçari	Bahia	1992	Centro de Pesquisas e Desenvolvimento, CEPED
Campina Grande	Paraíba	1987	Fundação Centro Regional de Technologia em Informógico da Paraíba, ParqTec -PB
Crato	Ceará	1992	Universidade Regional do Cariri, URCA
Curitiba	Paraná	1990	Instituto de Technologia do Paraná, TECPAR
Florianópolis	Santa Catarina	1986	Fundação Centro Regional de Technologia em Informática, CERTI
Fortaleza	Ceará	1992	Centro de Treinamento e Desenvolvimento, CETREDE, from Universidade Federal de Santa Catarina, UFSC
Itu	São Paulo	1991	Department of Assistance to Micro Industry and Small Industry (DEMPI) of the Federação das Indústrias do Estado de São Paulo (FIESP)
Porto Alegre	Rio Grande do Sul	1992	Centro de Biotecnologia do Rio Grande do Sul, Universidade Federal do Rio Grande do Sul, UFRS
Porto Alegre	Rio Grande do Sul	1991	Secretaria da Produção, Indústria e Comércio
Recife	Pernambuco	1992	Instituto Tecnológico do Estado de Pernambuco, ITEP
Rio de Janeiro	Rio de Janeiro	1993	Fundação COPPETEC, Universidade Federal do Rio de Janeiro, UFRJ
Rio de Janeiro	Rio de Janeiro	1990	Pólo de Biotecnologia do Rio de Janeiro, Fundação BIORIO
São Carlos	São Paulo	1986	Secretaria da Ciência, Tecnologia e Desenvolvimento Econômico do Estado de São Paulo
São Carlos	São Paulo	1993	Fundação Parque de Alta Tecnologia de São Carlos (ParqTec-SC)
São Paulo	São Paulo	1992	Department of Assistance to Micro Industry and Small Industry (DEMPI), Federação das Indústrias do Estado de São Paulo (FIESP)

Note: excludes extramural incubators, virtual incubators, open incubators, incubators without walls.

Each tenant occupies between 20 and 60 sq. metres , paying rent as high as $8.60 per sq. metre. In many of the cases analyzed, the subsidized real estate aspect of the incubator was overrated, given limitations such as the factor that almost half of Brazilian incubators possess no specialized advisory services. The survey often found a lingering paternalism on the part of the entity managing the incubators. However, interviews suggested that entrepreneurs consider Government a necessary partner in an incubator organization. The Government serves as a "rear guard," ensuring a financial lifeline for survival while leaving the project safely operating within the private sector.

Principal criteria for selection of tenant businesses at most incubators include:

1. Technical and economic viability of the business and its products
2. Potential for increasing commercial profit

3. Qualifications of the applicant and management team
4. Prospects for financial self-support outside incubation
5. Consistency of the business with the incubator's objectives
6. Requirement that the manufacturing process not produce any form of pollution
7. Little or no competition with other businesses in the incubator

Rather than a lease agreement, the incubator and tenant sign either a "partnership agreement" or an "incubation services agreement," which covers the provision and use of physical space, administrative infrastructure, and specialized services (mainly consulting). Such a contract stipulates the incubation period and describes the course prescribed for each phase of the business. Another clause concerns the common costs. Experience showed that such agreements are preferable to a standard lease agreement. Other typical clauses include: restrictions on the manufacture of certain products, deadlines for payments, fines, life of the commitment, description of incubator services, obligation of compliance with the incubator's internal regime, obligations of the parties, non-performance of the contract and its cancellation, and modifications to the facilities.

Typically, a business will stay in an incubator for anywhere from two to three years, depending on a continuing evaluation by the incubator board and incubator consultants. Exceptions are noted, such as the tenant that required a court order to be evicted after five years. An incubator imposes a cost-recovery system as shown in Table 5-4.

Table 5-4: Cost Recovery

Stage	Charge as a % of Market Cost
Start-up	10
Growth	30
Consolidation	50
Maturity	80
Third Year	100

Difficulties

The chief difficulties associated with the Brazilian incubator programme are in six areas:

1. **Entrepreneurial experience:** The typical prospective tenant is driven by ideas, effort and enthusiasm, yet is without significant financial resources. In addition, the entrepreneur may not be fully aware of the risks that face a new business. These problems are particularly severe in the technology-based businesses that are the focus of the incubation process. Other constraints include small and specialized markets for products, stiff competition, non-existent lines of credit, and continuing product development in an ever-changing technological milieu.
2. **Incubator performance:** A number of Brazilian incubators are not performing well, with nearly 40% having design and management problems. With fewer qualified applicants than vacancies, the incubators in Brazil may be under pressure to bend the admission requirements to maintain an occupied facility. Some incubators were also started without a market assessment, and thus, without apparent need.
3. **Specialized services:** More than half of the survey respondents indicated problems with the delivery of specialized services, including a lack of supporting infrastructure. Many tenants report business services and consulting are either weak or not available, especially in legal, accounting, financial, management and marketing, training, human resources, design, and cost and quality control areas. Tenants with prior experience as managers were less concerned with these omissions than those without such experience.

4. **Infrastructure:** Almost 45% of the entrepreneurs indicated problems with physical and operational infrastructure, specifically the need for more telephone lines, computers, laboratories, specialized offices, equipment, technical libraries, and more physical space. These shortcomings may be the result of a mismatch between incubator capabilities and tenant desires. Businesses also reported problems in con ducting shared and cooperative activities.
5. **Financial support:** Nearly a third of surveyed entrepreneurs reported that a lack of financial resources poses serious constraints to the development of their business. Without sufficient capital, businesses tend to languish.
6. **Linkages:** A common problem is the fragile, if not non-existent, linkage between the incubator and other agents of the SE development process. The surveys indicate that the plans for more incubator networking with communities may not have been implemented.

Incubators are reported not to be performing a technology-transfer function, contrary to prior expectations. Criticism was levelled at the federal Ministry of Science and Technology for generally focusing resources on research, while neglecting technology commercialization through the incubation modality. With universities as sponsors of some incubators, this balance in priorities becomes particularly important.

5.4 Developing Public Policy

Success of an incubator in Brazil depends on specific factors in the local socio-economic milieu—geographic area, available services, the management team, knowledge and aggressiveness of sponsors or partners, and the level of expertise of its human resources. The minimum requirements for establishing an incubator are:

- A supply of interested and qualified entrepreneurs
- Technical and commercial viability of proposals
- Partners committed to the enterprise
- Committed community presence of incubator management
- Local involvement and political support for the incubator
- The availability of laboratories and human resources

Further advisable requirements are:

- Adequate physical space
- Appropriate incentives and a secured line of credit
- Private-sector management of the incubator and minority Government participation that gradually decreases over time
- Ideal market timing of tenant projects
- Siting incubators inside associated institutions of learning and research (except for traditional industry incubators, e.g. handicrafts)
- Affiliated professionals with a track-record in generating technology-based businesses (except for traditional industry incubators)

A nationally coordinated business incubation system incorporating the following five areas of management in an integrated programme would address both the emerging opportunities in Brazil and the shortcomings of existing programmes:

1. **Business subsystem:** transforms knowledge into products, processes, and services accepted by the market.

2. **Incubator subsystem:** supplies the means for the business to grow and consolidate itself, which includes the role of the coordination "agent" who establishes the links that tie the various subsystems together.
3. **Source subsystem:** institutions responsible for creating the technology that forms the basis for the businesses.
4. **Milieu subsystem:** environmental conditions that affect the trajectory of the business, including inflation, interest rates, economic plans, and Government support for technological development.
5. **Market subsystem:** synthesis of the entire effort of the business, encompassing clients, competition, and partners.

To establish an incubator on solid ground, the venture must be freely undertaken and operate according to the realities of the marketplace. Therefore, the success of the project will depend upon whether the incubator is well integrated into the private economic milieu and has identified local needs and idiosyncrasies. These aspects were not always observed in the case of the incubators surveyed, to the detriment of their respective missions. If an incubator is present in a city, it should be because the community wants it there. The partners who band together to support the enterprise should be willing to contribute resources to keep the facility healthy, fiscally and otherwise.

Recently, incubators have been established which play host to businesses in the traditional sectors of the economy (apparel, paper, handicrafts). Businesses associated with these sectors should also keep abreast of the new technologies, in both production and management. The surveys conducted show that this new type of incubator is viable, thus indicating two sub-modalities of incubators in the Brazilian context.

Despite the various developments mentioned, Brazil does not yet have a strategy for incubators and no in-depth research has been done to analyze their impact on the economy—e.g. numbers and kinds of products that were generated, global invoicing of these enterprises, and the numbers and kinds of businesses and jobs created. Considering that Brazil has 42 incubators, one can estimate the number of jobs at about 2,570, using the average of 61.2 jobs per incubator. The impact of these employment figures is statistically insignificant in comparison to the Brazilian economy as a whole. However, incubators represent a shift in thinking and a new attitude toward entrepreneurship and the role of microenterprise in the information society. Those effects, although not quantifiable, should nonetheless be considered when the modality is assessed.

Based on these findings, the Brazilian Government, through the Industry Technological Training Support Programme (PACTI), is preparing a paper titled, "Strategy for Assisting Business Incubators." This document establishes the lines of support for incubators, as decided by mutual agreement with various players in the national economy, including ANPROTEC. A preliminary analysis of this draft document indicates the following federal guidelines:

- **Selective contribution of resources:** federal support would be conditional upon support from theprivate sector, universities, and resources from state and local Government;
- **Sustainability:** the incubator will have to prove it has the ability to support itself and to avoid chronic reliance on resources from the Federal Government;
- **Coordination among the financing entities:** to ensure optimum allocation of resources and sharing of information;
- **Inducements:** to trigger the incubators' demonstration effect, facilitate the adoption of technological innovations, and allow investments in a greater number of enterprises;
- **Evaluation:** to determine future funding eligibility and needs;

- **Regional socio-economic reality:** an incubator must play a role in an overall regional policy, including measures fostering the emergence of a culture of entrepreneurship;
- **Advance probing of events:** to facilitate the exchange of information and to ensure optimum allocation of resources;
- **Full service:** preferential support to entities that manage incubator resources, passing the benefits along to the businesses, while evaluating the results.

Some guidelines are already in place. The agencies involved with the implementation of this programme are: the Ministry of Science and Technology; the Ministry of Industry, Commerce and Tourism; the National Scientific and Technological Development Council (CNP); the Fund to Finance Studies and Projects (FINEP); the Bank of Brazil Foundation; the Federal Development Bank; the National Confederation of Industry (CNI) Euvaldo Lodi Institute (IEL); and SEBRAE. Following similar guidelines for state and local Governments, start-up plans always attempt to involve the private sector.

Evaluation of Incubators

An important aspect of Brazil's incubator policy includes the systematic evaluation of enterprises, the agencies that manage the incubators, and accountable Government authorities. Incubator performance indicators will be developed based on these evaluations in progress. An alternative way to evaluate results involves an estimate of the "opportunity cost"—the business's costs were it not in the incubator but made use of a similar structure and services. The cost of the subsidy provided by the Government or a similar entity to the incubator for maintenance (miscellaneous expenditures, equipment upkeep, staff) is estimated at one third of total costs. Therefore, two thirds of the costs should be borne by the businesses in incubation. Most incubators have not yet achieved this goal, even though managers had agreed in principle with both the estimate of costs, and that they be borne by tenant businesses to avoid paternalism.

The consensus in Brazil holds that Government (or similar institutions) should support the incubators; however, it does not extend to the duration and quantity of such support. While incubators fully funded by the private sector are not yet feasible, the above structures are believed to be the best guarantee of maximum efficiency in operations. The incubator represents a step forward in the support provided to microenterprise, facilitating partnership among actors in the economy, cost sharing, and encouragement of small businesses to organize into associations, especially in the pre-competitive phase (before their product is marketed). Incubators also have their limitations. They are not a completely automated and foolproof way of creating new businesses. Incubators are an initiative that cannot succeed by the sheer will of any single individual or institution, but they can flourish provided there is real agreement and shared responsibility among the interested parties: universities, business associations, the Federation and Centre of Industry, SEBRAE, Government agencies, and full participation of the local community.

This analysis focuses on the university, the Government, contractual relations (business/incubator), on tracking real market costs (costs outside the incubator), and on the data network formed to strengthen the incubators. Some adjustments to the incubation process are proposed.

Universities: The pilot incubators heightened the interest of a considerable number of people in the academic community, and are providing new direction to professors and researchers. Even those who defend the purity of academic activities, can see that the technology-based micro and small enterprises, created on the basis of university research, have not tainted their integrity, or exclusively commercialized scientific research methodologies. In Brazil, however, concrete steps must be taken to solidify the alliance between the incubators and the universities.

Many universities have not yet established mechanisms to support the initiative.

Government (municipal, state, and federal): Government participation is essential as it usually acts as financier for the incubator. While Government participation cannot be interrupted, as this could weaken the incubator, it must also decrease over the course of time in order to avoid creating an unhealthy dependency. It is recommended that the Government perform its role in combination with the other partners, and that it complement their activities. These other partners include learning and research institutions, professional associations, and SEBRAE. SEBRAE is a private institution and its main source of funds is from the taxes paid by corporations, through a percentage of their incomes as defined by law. SEBRAE has provided incubator support since 1990, acting mostly as a partner and paying part of the expenses with planning, development, special training, and consultative support. Part of SEBRAE acts like a consulting company, receiving payment for some of its services, which are provided in most Brazilian cities.

University/business collaboration: In some cases it is recommended (if not contractually obligated) that the incubator establish strong ties with the university or research institute sponsoring the initiative. Such a recommendation has usually proven vague and ineffectual. Ideally there would be a set fee for a minimum number of laboratory hours or human resources used, in addition to the fee normally paid for using the incubation system (the operating expenses). Such a process stimulates greater interaction between the business and the learning and research institutions that support the initiative. Should these relationships become an integral part of life at the incubator, entrepreneurs will see the benefit of paying for the cost of time used over the established base. Without a basic level of interaction, however, the minimum costs will be viewed as an unjustified burden. Such a measure would help businesses see the incubator as more than a place to merely set up shop, and would also encourage exchanges between entrepreneurs and researchers.

Costs: The cost of the lease and other services charged to the incubated business should represent a percentage of real market costs. Such a market link provides the entrepreneur with an idea of what his or her real costs will be and sets a basis for pricing products under development that reflects a sustainable profit margin. With such market-linked pricing mechanisms, the graduating entrepreneur will not be overwhelmed by the real prices of goods and services outside the incubator.

Incubators are a new phenomenon in Brazil. They are mandated to interact with one another in order to share experiences and ideas. The National Association of Incubators and Technological Parks (ANPROTEC) was created in 1987 with that objective. Its goal is to aggregate, represent, and defend the interests of the incubators and their tenants. Its results have been positive, as verified through the development of a network linking the incubators, numbers of training courses administered, and an annual symposium. ANPROTEC is an important forum for discussing common problems and shared solutions, for both tenants and incubators.

5.5 Case Studies

Three cases provide further information on the development of incubators in Brazil. The two oldest incubators, São Carlos-CEDIN (1986), and Florianópolis-CERTI (1987), are balanced by one of the newest, created in the city of São Paulo by FIESP, the Federation of Industries of São Paulo (1992).

As the incubator phenomenon is still recent in Brazil, and there is a lack of more objective data, each judgement is conditional. However, it can be asserted that Florinanópolis can be considered successful, São Paulo has average performance, and São Carlos-CEDIN lags behind, mainly because of management problems.

Florianópolis (CERTI)

The Fundação Centro Regional de Tecnologia em Informatica (Foundation Regional Centre of Technology in Informatics, or CERTI), managing entity for the incubator at Florianópolis, is a non-profit, private organization, administered through a university foundation. The incubator is one of the activities of CERTI, located on the campus of the Universidade Federal de Santa Catarina (Federal University of Santa Catarina, or UFSC). The incubator is supported by UFSC, by federal agencies, by the industry federation, and by several agencies subordinate to local and state Government. CERTI was created in 1984, and its range of activities includes R&D in the following areas: special measurement systems, products testing, quality control automation, mechanical instrumentation, optics and electronics, and quality management. The basic goal of the institution is to align academic research with industry demands. CERTI occupies its own 3,200 sq. metre building.

CERTI's incubator, formed by technology-based businesses, was created in 1987 (it is the second oldest incubator in Brazil) and occupies a total area of 1,913 sq. metres (1,303 sq. metres of leasable space) in a rented building. This incubator is about 5 km from CERTI's headquarters on the university campus. Each business occupies an exclusive area varying between 29 and 212 sq. metres.

The incubator recently transferred to a new, custom-built structure, with the capacity to incubate 30 businesses. It is located in the Parque Tecnologico de Florianopolis (Florianopolis Technological Park). In addition to the new building (to be known as the Centro Empresarial para a Laboracao de Tecnologias Avancadas, or CELTA, the Entrepreneurial Centre for the Development of Advanced Technologies), another building nearby will function as a Central de Servicos do Parque Tecnologico (Services Headquarters of the Technological Park). This facility, housing all necessary community infrastructure—banks, restaurants, auditoriums, laboratories—will also be used by the incubator.

Fifteen businesses are in incubation, while others are currently being selected to occupy the new building. Eight businesses have graduated, and seven of those remain in operation. The number of direct jobs at the incubator is 138 people (128 employed in the businesses and 10 in the incubator's administration). The incubator's businesses represent telecommunications, precision mechanics, electronics, new materials, biomedical engineering, automation, and technological services.

The incubator has had some problems, including excessive numbers of people working in administrative offices (increasing the costs to the businesses), changes in the administrative staff, lack of marketing support for tenant businesses, and failed initiatives. One such failed initiative is promotions related—the Escritorio de Promocão Empresarial da Incubadora (Incubators Entrepreneurial Promotion Office). In retrospect, it must be noted that an incubator staff group cannot function as a public relations department for individual businesses. The experience highlighted the responsibility of each business to act independently, doing its own marketing and selling its own products. All involved are trying to redirect the incubator, making good use of the move to the new building and the increase (to 30) of the number of businesses that will be incubated.

Among the Brazilian incubators, the Florianópolis facility has one of the best expense-control systems, featuring total transparency to the businesses regarding budgets—including the salaries of the director and the manager of the incubator. Charges to businesses currently cover 80% of the incubator's operating expenses; in the other two cited incubators, the same rate drops to one third. The goal of financial sustainability remains a target at Florianópolis. Those responsible for this incubator have significant levels of experience. Unlike the staff of other incubators, the Florianópolis staff frequently attends national and international events about incubators, turning the identification of problems and the search for solutions into an easier and more manageable task.

São Paulo (FIESP)

The incubator of the Federacão das Industrias do Estado de São Paulo (Federation of Industries São Paulo, or FIESP), initiated its activities in May 1992. Unlike the other cases analyzed here, it is an incubator that shelters businesses mostly from the traditional sectors of the economy, e.g. leather goods, confections, wrappings, mechanics, etc. FIESP is a non-profit, private, patron-class organization. Within FIESP, the section responsible for the incubator is the Departamento da Micro, Pequeña e Media Industria, or the Department of Micro, Small, and Medium Industry (DEMPI), whose principal activity is to administer training courses to companies and perform specialized consulting. The incubator is one of DEMPI's activities.

The incubator in São Paulo is located in a building used previously as a warehouse, and which belongs to an organization subordinated to the FIESP system. The total area is 838 sq. metres, with 480 sq. metres used by eight businesses (modules range from 60 to 80 sq. metres) employing 37 people. Ten businesses have graduated, of which eight remain in operation. Entrepreneurial training, including marketing and finance, is a large focus at the incubator. Since the businesses work with traditional areas of the economy, the average educational level of the entrepreneurs is lower than in the technology-based incubators. As a result, a special educational programme package, designed by FIESP, is provided to those entering the facility.

The main deficiencies of the incubator are: a lack of connection with universities, little interaction with the other Brazilian incubators, and non-attendance at international events. Other problems include poor maintenance of the incubator building, no on-site management (only a secretary is in the incubator), and slowness in meeting basic needs of the tenants and the facility— postponed repair of the fax machine, unimproved security after a number of thefts. Although FIESP is a private organization, its large size presents the problems typical of a public institution—bureaucracy, and slowness in answering the businesses' demands. Institutional priorities include transferring some expenses to the entrepreneurs, such as the maintenance of the building, hiring a manager salaried by the businesses, improving the connection with other Brazilian initiatives, and offering better services to persuade tenants to shoulder a greater share of the incubator's costs. To FIESP's credit, it is completely aware of the incubator's problems. It plans to rectify the situation so that this facility's performance does not hinder the extension of the idea of incubators to traditional sectors of the economy.

São Carlos (CEDIN)

The Centro de Desenvolvimento de Industrias Nascentes (Centre for Development of Growing Industries, or CEDIN) is the oldest incubator in Brazil. CEDIN started its activities in 1986, in its own building, built by the Government of the State of São Paulo in an area donated by the São Carlos City Hall. The structure measures 949 sq. metres , with 576 sq. metres available to businesses in eight modules of 72 sq. metres each. The organization responsible for the management of the incubator is the Secretaria da Ciencia, Tecnologia, e Desenvolvimento Economico do Estado de São Paulo (São Paulo State Bureau of Science, Technology, and Economic Development), a Government organization. The incubator's many problems begin with this location. As a Government organization based in the city of São Paulo (about 300 km from São Carlos), the major problem is one of being on the periphery of federal power, in addition to the generally slow administrative and bureaucratic decision-making pace of Government institutions.

At this writing, the entrepreneurs are attempting self-management of the incubator, trying to compensate for the lack of administration. In the decade of existence of this incubator, its ongoing problems have been significant. The application process is slow and modules are vacant for long periods of time. The marketing, development, and training support to the entrepreneurs was generally deficient, in spite of some good isolated efforts.

Despite two important universities in the city, plus a significant concentration of technology-based companies, the relationship between the academic institutions and the incubator is distant.

The São Carlos incubator became a building which was rented to the companies, just like a conventional real estate development—lacking the synergy and the expected support that characterize incubators. The managerial problems present in the CEDIN incubator are cyclical, due to the changes in the guidelines adopted by the Bureau regarding the undertaking. Such a situation supports the argument that a Government organization should not manage an incubator. It is better that the initiative stay in the hands of the private sector (preferably a non-profit organization), as is the case in half of the Brazilian incubators.

Despite these problems, eight businesses are located in the incubator and 11 have graduated, nine of which remain in operation. They are in the sectors of biotechnology, mechanics, veterinary products, new materials, and instrumentation. The technical board of the State Bureau of Science and Technology, under the present administration in Brasília, has not shown interest in supporting the incubator. Earlier, in 1993 and 1994, there was more support. Contracts with businesses were reformulated, and a more comprehensive package of services was proposed, more in keeping with the typical objectives of an incubator.

Contract management is now being considered, either by a private organization (already managing another incubator in São Carlos) or by a research institute, such as the Instituto de Pesquisas Tecnológicas de São Paulo (Technological Research Centre of São Paulo, or IPT) which has more autonomy and quicker administrative response time than the Bureau. In spite of the changes implemented, and others that are planned, the present administration of the State Bureau (which took over the position in January 1995) has yet to support the incubator.

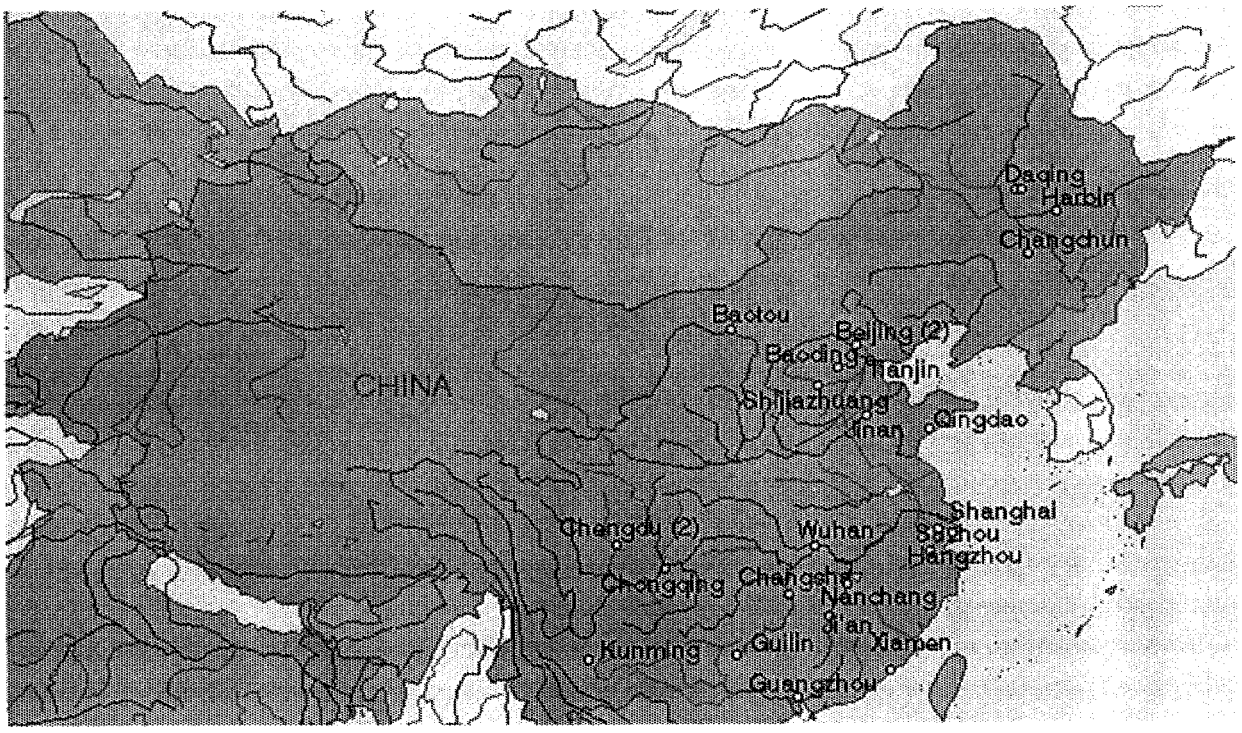
6 CHINA

6.1 Overview

Small enterprise creation programmes, technology parks and business incubators have flourished in China due to the strong support of the Government in recent years. The TORCH programme—so named for its bearing the "flame of new economic growth"—has taken the lead in developing business innovation centres based on the successful experiences of developed countries. This was initiated by a UNFSTD-sponsored study in 1988 which examined the feasibility of technology incubators in China. As a result of the TORCH initiated innovation centres, over 2,000 small and medium-sized enterprises have been supported in their development, including more than 10 enterprise groups with a total asset value surpassing US $12 million. This experiment has proven the adaptability of the technology incubator modality to the Chinese situation. The programme plays an important role in economic development and in the establishment of a combined socialist-market system. Innovation centres themselves promote commercialization of technological findings and research results, as well as internationalization of science and technology enterprises.

This country study focuses on public resources devoted both to the establishment of high and new technology-oriented enterprises, and to the support of small and medium-sized enterprises involved in technology development, production, and marketing. Data on 51 innovation centres in China is presented, in addition to descriptions of operational modes and their relation to the success of tenant companies. Incubators in the innovation centre system focus on high and new technology development, with locations in 27 provincial and municipal development zones (see Figure 6-1).

Figure 6-1: Incubators in China



6.2 Incubators

Performance

No quantifiable set of criteria is available for assessing the performance of incubators in China. A variety of criteria are, however, used to examine individual incubators, including:

1. Incubator site and associated service facilities to be leased
2. Stable and high-quality management team/standards
3. Scientific management and associated methodologies
4. Efficiency in routine activities, co-ordination, and public relations
5. Standard and efficient personnel system
6. Well-prepared training plan and fruitful training results
7. Frequent turnover of new enterprises and graduating tenants
8. Well-maintained security and safety precaution systems
9. Positive comments regarding incubator from local Government and graduated enterprises
10. Capability for project assessment and economic feasibility analysis
11. Standard financial management and statistical systems
12. Reliable fund-raising channels and means
13. Potential in graduated enterprises for scale production
14. Capital return from tenant payments for routine operation of the centre
15. Capacity for both legal consultation and handling disputes

The innovation centre formulates support plans tailored to individual entrepreneurs, based on his or her personal character, public perceptions of credibility, track record of management, and the specifics of the enterprise. A technical feasibility study (including confirmation of intellectual properties, assessment of intangible assets, and verification of technical capacity) are completed as an early step. With the completion of feasibility studies, the process of locating financing, bidding for investment, recruitment, training, enterprise (re)structuring, formulation of regulations, and marketing strategies, can begin. The Chinese innovation centres, unlike many incubator systems around the world, will provide some 5-20% (up to a maximum of 50%) of the risk funds required by the enterprise, if other sources of financing are not available. As an equity investor, the incubator is involved in the decision-making process of the enterprise.

The Role of Incubators

The role of the incubator is to develop a new enterprise over a two to three year period, with a goal of registered capital increasing five to 10 times, thus preparing the enterprise for graduation to the development zone. In addition, the incubator is charged with nurturing capable management staff, while meeting the needs of tenant enterprises at different stages of their development.

The functions of the incubator include:

• **Training of entrepreneurs:** The challenge is to turn scientists and technicians into S&T entrepreneurs with a strong knowledge of technology, management, and marketing. It is not sufficient to provide merely shelter and survival in the incubator. Inventors will be transformed into S&T entrepreneurs through extensive, flexible, and integrated training programmes. The experiences of these entrepreneurs will in turn be plowed back into the teaching materials for new trainees.

• **Commercialization of high and new technology results:** China generates more than 10,000 technological findings and patented technologies every year. However, as a developing country, its commercialization rate is

very low, with only 25% of these findings reaching the market. The innovation centre is charged with creating a micro-environment for technological innovation and commercialization of scientific results, as well as with providing the conditions necessary for the development of an enterprise. With the help of innovation centres, the commercialization rate of new technologies has reached more than 80%. Of these, 30% represent technology transfer and technological cooperation, while 70% represent the commercialization of indigenous developments.

• **Transfer of graduated enterprises:** Following fixed standards for graduation, businesses pass out of the incubator and into the development zone. By the end of 1993, 159 enterprises graduated from 29 innovation centres. As they mature, these 29 centres project graduating 1,165 enterprises before the end of the century.

Services

The services offered by innovation centres in China are similar to those in other countries (See Table 2-21). Local Governments developed and implemented favourable policies and allocated funds to these centres. Their initiatives complemented the national programmes under the aegis of the TORCH programme.

Investment

At the initial development stage, the major funding sources were the seed funds allocated by the TORCH programme, or supporting funds from local Governments. Most innovation centres also required bank loans through the cooperation of local and national lending entities (Table 6-1).

Incubators vary greatly in size, from the equivalent of a few small offices, to significantly sized complexes. While only eight incubators have operated for at least three years, high occupancy rates and sizeable total tenant populations are common. The long-term results produced by these incubators have yet to be realized; however, since the capital investment is largely in place, the cost per job will diminish in the future (Table 6-2).

Bank loans are a significant source of financing for the development of incubators in China (Table 2-7). These funds were mainly used in the development of office buildings, work spaces, and other fundamental expenditures such as administrative costs and salaries. A significant percentage of these funds was used to support the development and production of the tenant enterprises (Table 6-3).

Overall, the tenants of the Chinese incubators are concentrated in a few technology-based fields, particularly computers and electronics (Table 6-4).

Fifty-one innovation centres constitute the sample examined. These centres, opened between 1987 and 1993, represent over 2,000 enterprises and include 1,696 tenants, 156 shareholding enterprises and 159 graduate companies. The tenant enterprises, and the innovation centres themselves, represent a positive contribution of over $190 million to the economic output of the country.

Given the focus on technology-oriented ventures, the large numbers of employees coming from universities and research institutions is not surprising. The significant numbers of retired people employed by these ventures also provides a positive social benefit, while breaking the stereotype of employees in emerging technology companies (Table 6-5).

China is in the midst of shifting fundamental national policies—both from a planned to a market economy, and from Government-controlled to autonomous enterprises. As Government agencies and the industrial community grope for new ideas and new models, the concept of an incubator/innovation centre fills a critical gap in existing strategies.

The organizational structure of the incubator includes significant participation at the national level. Particular innovation centres may or may not incorporate the structures of the development company or the shareholding company, but this depends on local needs and desires (Figure 6-2).

Figure 6-2: Incubator Organization Structure—China

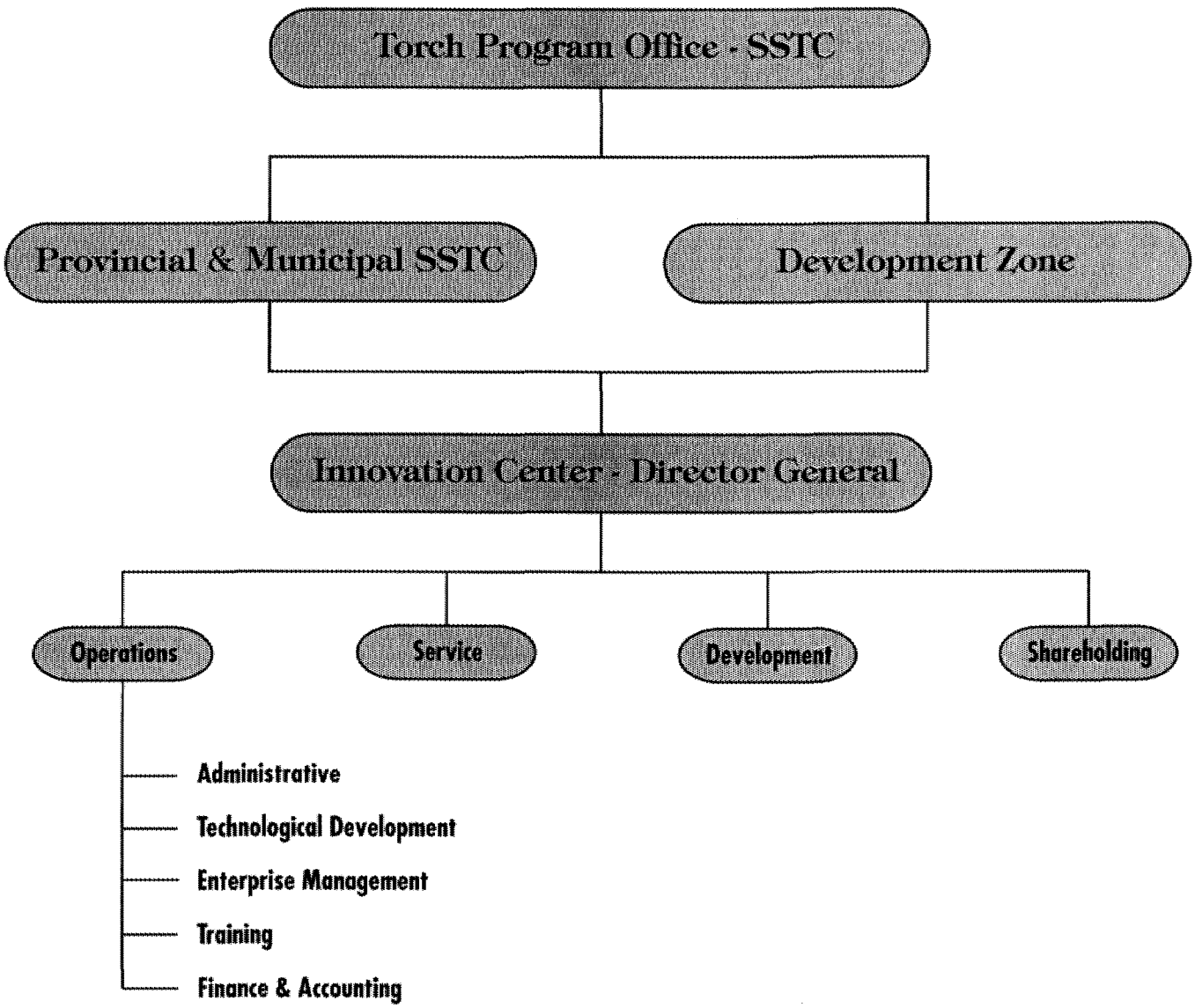


Table 6-1: Incubator Programme Investment in China – US$ '000s

	Feas. Study	Bus. Plan	Purch.	Facility Build	Repair	Equipment	Train Staff	Oper. Subsidy
Wuhan	2.0	3.8	20.0	1.5	49.4	1.4	15.5	2.8
Tianjin	3.0		27.0	762.0	185.0	5.0	15.0	65.0
Harbin	2.0		3.5		5.0	6.2		7.7
Chengdu			30.0	450.0	25.0	5.0	20.0	30.0
Chongqing					5.0	5.0	5.0	10.0
Chengdu Inn.			25.0	250.0	30.0			25.0
Shanghai		50.8						
Guangzhou					30.0			
Daqing	1.6	2.8	20.7	1.1	9.2	4.5	11.6	1.7
Beijing				900.0	800.0	6.0		200.0
Weihai	1.0	0.5	35.0	260.0	25.0	0.5	35.0	
Hangzhou			13.5					
Yantai								
Changchun					30.0			
Guilin	3.0		10.0	2.0	5.0	1.0	5.0	2.0
Changsha	3.0	2.0	34.0	380.0	5.0	10.0	12.0	10.0
Shijiazhuang			35.0			20.0		30.0
Xiamen			2.5		2.0	0.2	0.2	3.8
Xi'an	0.5	60.0			17.0	2.0	10.0	50.0
Jinan	13.0			45.0		2.0	6.0	
Qingdao	8.5	25.5	17.0	1,275.0	25.5	8.5		
Baotou								
Suzhou		0.1	2.1	580.0	40.3	1.3		124.5
Shanghai								
Nanchang								
Kunming	1.8	2.3	36.0	70.0	19.0	1.0	1.0	1.0
Baoding	0.8		44.0		0.2	0.5	2.0	22.0
Fengtai								
Baoji	10.0		6.0			0.3		
Hengyang			20.0	1,200.0	20.0	5.0	5.0	10.0
Hefei								

Table 6-2: Incubators, Tenants, and Employees—China

City/Name	Province	Open	Space, sq. metre		Tenants			
					# of businesses		# of employees	
			Gross	Rentable	1993	1994	1993	1994
Wuhan	Hubei	7 Jun 87	8,000	6,600	133	148	2,508	2,814
Tianjin	Tianjin	May 91	11,000	9,023	47	56	815	889
Harbin	Heilongjiang	Jan 90	8,500	3,042	142	164	2,762	3,518
Chengdu	Sichuan	Nov 89	6,200	4,600	37	52	781	1,291
Chongqing	Sichuan	Oct 90	21,197	17,697	50	80	1,600	2,700
Chengdu	Sichuan	Nov 87	14,375	13,614	6	10	591	680
Shanghai Hi tech	Shanghai	24 Dec 91	9,880	9,600	42	48	2000	2000
Guangzhou	Guangdong	Mar 92	9,860	8,258	60	60	1,173	1,105
Daqing	Heilongjiang	1 Sep 93	11,300	3,000	40	78	1,068	1,927
Beijing	Beijing	Dec 93	8,300	2,410	12	17	110	140
Weihai (DZ)	Shandong	Oct 90	3,950	1,883	8	6	197	139
Hangzhou	Zhejiang	Oct 91	12,220	7,100	32	25	208	187
Yantai	Shandou	19 Oct 92	1,700	200	24	26	280	350
Changchun	Jilin	8 Aug 92	15,000	7,500	82	108	746	982
Guilin	Guangxi	Sep 89	3,222	2,000	52	41	280	220
Changsha	Hunan	Mar 90	1,460	1,000	4	5	50	80
Shijiazhuang	Heibei	Jul 91	2,500	2,300	20	45	410	957
Xiamen	Fujian	Aug 93	1,335	632	5	5	46	67
Xi'an	Shaanxi	28 May 93	4,000	3,850	10	32	150	400
Jinan	Shandong	Oct 92	295		101		27	27
Qingdou	Shandong	23 May 93	10,500	10,500		2		60
Batou	Inner Mongolia	Nov 93	7,659	7,659		10		93
Suzhou	Jiangsu	2 Aug 94	4,320	3,030		26		180
Xinxing	Shanghai	24 Jun 94	2,885	1,677		12		116
Nanchang	Jianqxi	92	2,201	2,201		5		6
Kunming	Yunan	Feb 94	1,500	1,000		11		157
Baoding	Hubei	Sep 94	5,919	5,600		8		170
Fengtai	Beijing	10 May 94	11,358	4,653		58		566
Baoji	Shaanxi	8 Oct 93	6,000	3,000		8		410
Hengyang	Hunan	Jan 94	1,000		11	13		287
Anhui (Hefei)	Anhui	Apr 93	1,100	885	54	69	697	990

The innovation centre in China is a State-owned, non-profit organization. If the centre purchases equity in other enterprises, or in a shareholding company, those investments remain State-owned. The retained earnings from the innovation centre, as well as dividends from investments, remain assets of the State and are managed consistent with applicable national regulations.

Table 6-3: Capital Investment in Incubators

Purpose	Investment US millions	%
Site construction	$42	68
Project support	17	27
Administration	3	10
TOTAL	$62	100

Table 6-4: Incubator Firms by Industry

Industry	Firms No.	%
Electronic information	850	39
Integrated machines/electronics	451	21
Biotechnology	281	13
Advanced materials	205	10
Energy saving/new energy	121	6
Environmental protection	55	2
Others	201	9
TOTAL	2,244	100

Table 6-5: Source of Tenant Employees

Source	Employees Number	Percent
University	4,062	20
Research institutions	6,541	32
Other enterprises	3,673	18
New graduates	1,145	6
Retired people	4,394	22
Other	537	3
TOTAL	20,352	100

Focus and Standards

The main function of China's innovation centres is to assist science and technology personnel owning research and patents with establishing independent enterprises through provision of ready facilities and means. The goal is to realize the commercialization of technology through the vehicle of small enterprises. Based on a survey of 70% of China's centres, the following qualitative and quantitative requirements for success emerged:

Qualitative Requirements for Success:

1. Stable sources of tenant enterprises in the development zone
2. Stable management team with clear division of labour and highly efficient means of execution
3. Clearly defined standards for accepting enterprises as tenants and for enforcing their graduation
4. Business reporting and statistical statements to authorities at the local and national levels
5. Monitoring of potential illegal actions by tenant businesses

Quantitative Requirements for Success:

1. Office space for 10 to 20 enterprises
2. Basic service facilities provided
3. Minimum annual average of no fewer than five tenants accepted

4. Number of tenant enterprises operating after approximately three years is no fewer than twenty
5. Annual average of graduating enterprises is no less than three after the third year of operation
6. Minimum acceptable success rate of tenant enterprises is no less than 60%
7. Minimum number of annual training courses should number no fewer than two, with at least 15 attendees each
8. Targeted growth of net asset value after third year of operation is no less than 10%
9. Targeted gross revenue of tenant enterprises after five years of operation is no less than US $3.6 million
10. A documented research paper on the incubator to be published in the name of the innovation centre each year
11. Recommended annual income of individual managers of innovation centres to be no less than the average income of employees in the tenant enterprises

Surprisingly, 26% of the staff of innovation centres are drawn from the ranks of the jobless, while 22% were retirees. Centres strictly follow established criteria, both for entry to and exit from the centre, with graduation anticipated some three to five years after entry.

Enrolment criteria include both technical characteristics of the business and personal characteristics of the entrepreneurial team. Among the latter are:

- Minimum required educational level of the applicant
- Past performance of the applicant's business(es)
- Possession of at least one high or new technology product with clearly defined ownership
- Corresponding registered capital
- Completion of necessary documentation required by the Industry and Commerce Administration

Graduation criteria are keyed to meeting benchmarks in the business development process, as well as to concrete, bottom-line results. Criteria include:

- Three to five year tenancy in the innovation centre
- Sound infrastructure and operations of the tenant business
- Sound management principles of the tenant business
- At least one self-developed high or new technological product, coupled with new product capability
- Accomplishment of required economic targets

The innovation centre, mindful of its primary service objectives, creates its revenue either from the various services it provides, or by taking stock in tenant enterprises. Another mechanism for revenue generation involves collaborating with local banks and credit agencies to establish risk funds. These funds invest in major enterprises with the prospect of financial gain; however, in so doing, they support development of new products and services.

Funds that are earned by the innovation centre are reinvested in the operation of the centre and in new entrepreneurial enterprises. Aggressive development of alternative funding sources reduces the economic risk to the innovation centre while increasing the circulation of capital available to develop new ventures. Government funding, while elsewhere available for lengthy periods of time, is, in China, only available for the establishment of centres and for seeding new enterprises.

6.3 Conclusion

Based on a survey of Chinese innovation centres, the following factors are believed to reduce the success rate of tenant enterprises:

- Insufficient policy and financial support from local Government as a result of officials' poor understanding of the nature of the incubator, its functions and roles.

- Locating the incubator in an area where local educational standards are not up to national standards, and which does not successfully support exchanges of personnel, technology, and commodity information.
- Weak management of the innovation centre or frequent reshuffling of senior management.
- Debt-financing of operations, caused by unbalanced revenues and expenditures, and too heavy an economic burden from initial construction and equipment procurement.
- Undefined standards for enrolment and graduation; unclear relationships with tenants after graduation; dissonant relationships with critical parties in the development zone.

The innovation centre/technology-based incubator is a new venture in China, playing an increasingly important role in the development of the country's high and new technology enterprises. Considering the current trend, the TORCH Programme Office of the State Science and Technology Commission is planning to increase the number of innovation centres from the current 70 to a total of 200, with more than 10,000 tenant enterprises. These centres are anticipated to transfer 3,000 enterprises to the development zones, representing revenues of US $4.8 billion by the year 2000. By that time, 50 enterprise groups with annual gross revenues of US $12 million will be associated with direct employment for 230,000 to 250,000 people (Table 6-6).

Table 6-6: Projected Growth

Year	Tenant Enterprises	Office Space (million sq. metres)	Gross Output Millions of US$	Graduated Enterprises
1993	1,969	32	193	159
2000	5,945	80	1,072	1,200

Certain targets for both incubators and enterprises are recommended. The survival rate of enterprises reaching the following goals is estimated at 80%:

1. After five years, graduated enterprises will average 50 employees per business, with incubators yielding 3,000 enterprises employing 150,000 people.
2. After three to five years, tenant enterprises will average 20 people per business, with incubators yielding 3,000 enterprises with 60,000 employees.
3. 2,000 newly-established enterprises, in their first 12-24 months, will employ 16,000 people, averaging eight employees per enterprise.

6.4 Case Studies

Tianjin High Technology Innovation Centre

Located on the eastern coast, 100 km south-east of Beijing, Tianjin is one of three municipalities under direct jurisdiction of the Federal Government of China. The Centre is located in the 22 square kilometre New Tech Industry Zone in Tianjin, on an 11,000 square metre site. This zone includes nine universities and 1,600 high and new technology enterprises. The Centre is adjacent to Nankai University and Tianjin University (Table 6-7).

Land and 70% of the construction costs were provided by the Government in developing the Centre. The remaining 30% of capital costs were borrowed from a local bank (Table 6-8).

The director of the Centre, appointed by the Tianjin Science & Technology Committee, provides leadership for the incubator (Figure 6-3).

Figure 6-3: Tianjin Incubator Organization Structure

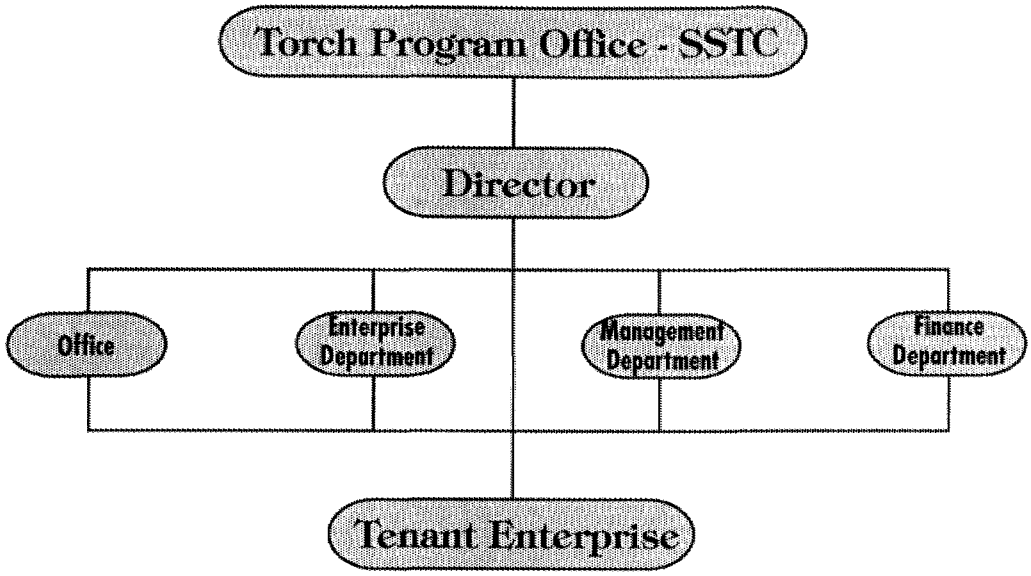


Table 6-7: Tianjin Incubator Summary

	1991	1992	1993	1994
Gross building area, square metres	5,000	5,000	11,000	11,000
Net rentable area, square metres	3,151	3,151	9,023	9,023
Tenant enterprises, number	21	23	47	56
Graduates, number		2	7	12
Employees, number	402	547	815	889
Gross sales volume, US$ millions	$1.3	$3.3	$8.7	$3.5
Profit and tax, US$ millions	0.2	0.6	1.8	0.0

Table 6-8: Tianjin Financing Overview

Financing Overview, US$ millions	1991	1992	1993	1994	Total
Government	0.3	0.3	0.1	0.0	0.8
Bank loans	0.1	0.3	0.0	0.1	0.5
Total capital	0.5	0.6	0.1	0.1	1.3
Operations:					
Income	0.05	0.07	0.2	0.3	0.6
Expenditure	0.05	0.07	0.2	0.2	0.5
Operating surplus (deficit)	0.0	0.0	0.0	0.0	0.1

Services provided by the Tianjin Innovation Centre include the following:

1. Infrastructure, in the form of office services, rented facilities and services from research institutes of universities, or enterprises adjacent to the Centre, including:
   - offices and workshops for production
   - water, heat, electricity
   - printing, mail-handling, telecommunications
   - financial services
   - conference areas and meeting rooms
   - security
   - library services
   - laboratory, metreing, and testing services
   - procurement
   - storage and transportation
2. Consultation on the establishment of enterprises, business development plans, product appraisal, project development, annual enterprise evaluation, market development.
3. Consultation on accounting and acting as agent on financial matters, including fund raising and preparation of monthly financial statements.
4. Public relations for tenant companies through computer networking, publications and literature, and conference exchanges.
5. Personnel training, particularly for management.
6. Certification of tenants for income tax incentives offered by Government.
7. Opportunity for intra-centre communication among enterprises, potentially leading to exchanges between domestic and foreign companies.

Tenant enterprises must be focused on the commercialization of new technology; therefore, businesses set up as trading companies are strictly prohibited at Tianjin (Table 6-9).

Table 6-9: Tianjin Incubator Technology Orientation and Ownership

Tenant's Technological Area	Percentage of Businesses
Electronics and computers	60
Integration of machinery and electronics	15
New materials	11
Biological engineering	5
Other	9

Type of Ownership Practised	Percentage of Businesses
Collective enterprise	42
State enterprise	31
Foreign-owned and joint venture	11
Stock company	11
Private business (non-stock company)	5

Screening of new tenant enterprises consists of a five step process:

- **Technological appraisal:** the product or process must be characterizable as high and new technology, with no dispute regarding the intellectual property rights, must have potential for further development, and technical personnel comprising at least 50% of the employees of the enterprise.
- **Economic appraisal:** the enterprise shall have registered capital of at least US $36,000, a full time accountant, and a three-year programme for development to achieve an average annual increase of 50% in output value.
- **Market appraisal:** demonstrated familiarity with the business's current market, and the potential for the next three years.
- **Legal appraisal:** qualification certificate for the enterprise denoting established understanding of the project technology and management capability.
- **Physical appraisal:** ability of the Centre to provide the space, water, and electricity needs of the venture.

Management attributes the success to date of the Tianjin High Technology Innovation Centre to the following characteristics of the programme :

1. **Government support:** policy guidance and financial support from the TORCH Programme Office through the municipal Government and the Tianjin Science and Technology committee.
2. **Location:** the New Tech Industry Zone provides a knowledge-intensive environment that includes necessary infrastructure, adjacent to famous universities.
3. **Service:** the ability to provide a range of services for new enterprises.
4. **Management:** keen-witted and capable management, with high-efficiency in providing whole-hearted service to tenant enterprises—not profit-driven.
5. **Networking:** extensive links to all walks of life, including support from departments of industry, commerce, taxation and banking, and utilities and security agencies.
6. **Enterprise development:** careful selection and optimization of tenant enterprises, including both their projects and their management, while addressing problems in funding and marketing.

The management has aggressive plans for the future, including the following:

- Recruitment of 50-60 enterprises each year, into space made available by graduating companies.
- Strengthening of funding of raising for tenant enterprises to develop US $2.4 million in investment over the next five years.
- Supporting the commercialization of technology through tenant enterprises, reaching an annual average of US $12 million.
- Improving the economic potential of the Centre by operating as its own enterprise and by taking shares of stock in tenant companies.
- Setting up a network of exchange and cooperation with international business incubators.

Shanghai Hi-Tech Innovation Corporation, Ltd.

Shanghai is the largest city in China. With 46 universities and colleges, it is home to 18,000 S&T professionals, and 50,000 persons engaged in scientific and technological activities. Since 1979, this environment has conceived some 10,000 inventions—with a current rate of 700 per year. However, with only 5-10% of these inventions reaching commercialization, the overall contribution to economic development could be improved.

Under the guidance of the board of directors, some 50 enterprises are in the incubation stage (Table 6-10).

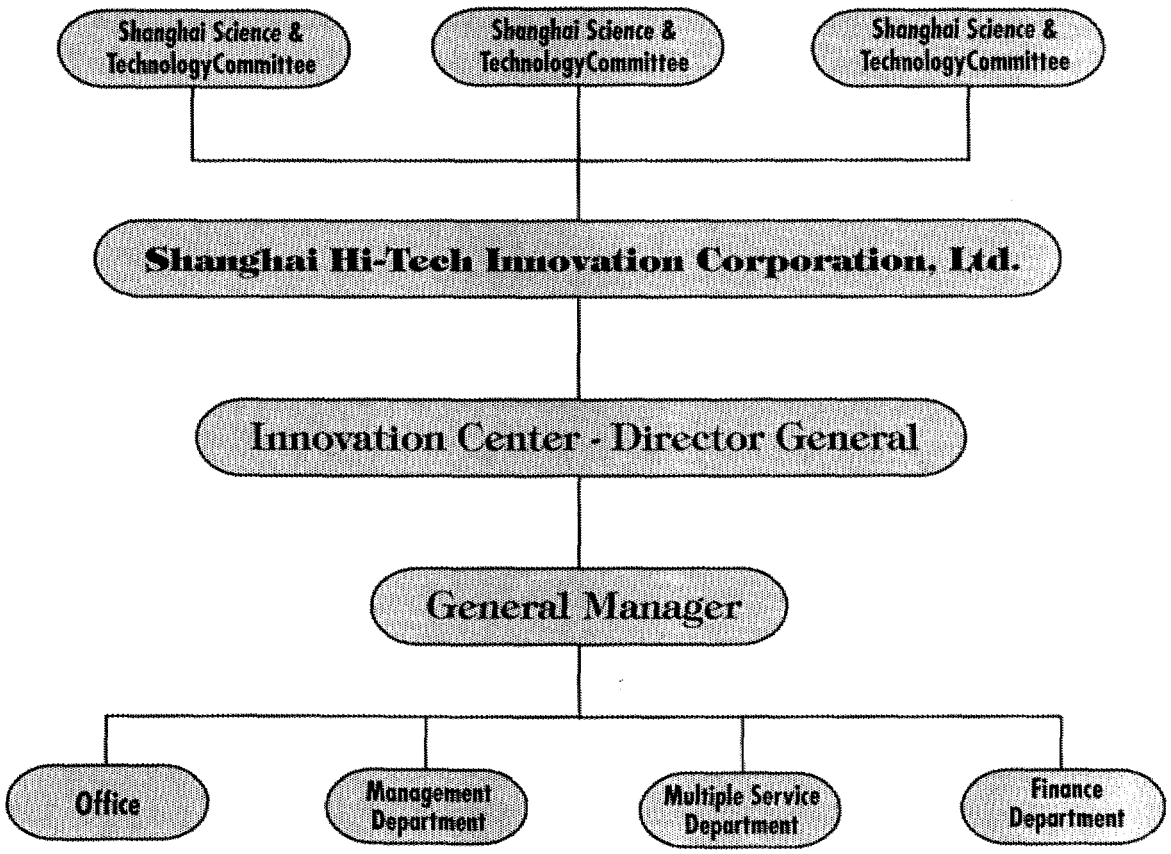
Table 6-10: Shanghai Incubator Tenant Ownership

Source of Enterprise	Number	Percent
Universities	25	50
Scientific research organizations	4	8
Enterprises	10	20
Non-Governmental	7	14
Joint stock companies	3	6
Sino-foreign joint ventures	1	2

Note: totals based on unrounded numbers not shown

Shanghai Hi-Tech Innovation Corporation was founded 24 December 1991, to promote and accelerate the process of industrialization, commercialization, and internationalization of the scientific inventions and achievements originating from local universities and colleges (Figure 6-4).

Figure 6-4: Shanghai Incubator Organization Structure



The number of projects being incubated grew faster than the number of enterprises in the Centre (Table 6-11).

Table 6-11: Ratio of Project to Enterprise Growth—Shanghai

	1992	1993	1994
Enterprises	24	42	48
Projects	30	57	75

These projects represent nine broad industry categories (Table 6-12).

Table 6-12: Shanghai Incubator Tenant Industries

Industry	Number	Percent
Micro-electronics	3	4
Computers and electronics	3	4
Communications	9	12
Medicine and bio-engineering	11	15
Automation of instruments & metering	27	36
Optical machinery/Electronics integration	11	15
Energy conservation devices	6	8
New materials	2	3
Marine engineering	3	4

The Shanghai Centre was capitalized with US $241,000 (Table 6-13).

Table 6-13: Shanghai Incubator Capitalization

Source	US$ '000s	Per cent
Shanghai Education Committee	US $120,00	50
Shanghai Science Committee	60,000	25
Caohejing Hi-Tech Park	60,000	25

The incubator is making a substantial contribution to economic development, helping to create more than a dozen medium to large businesses employing over 2,000 employees (Table 6-14).

Table 6-14: Shanghai Incubator Economic Development Impact

Indicator	1992	1993	1994
Sales revenues, US$ millions	2.9	17.2	18.6
Profit and taxes, US$ millions	0.4	1.7	1.2
Enterprises with output in excess of US $120,000/year	3	17	18
People employed	550	2,000	2,100

The main purposes of the Shanghai programmes are the transformation of technology research originating from local universities into products, and the enhancement of the incubating function with support from Government and financial organizations. It achieves this through collaborations with such local organizations as the Shanghai Education Committee. The programme aims overall at the application of modern enterprise management for tenant enterprises, and the improvement of their performance, thus generating enhanced social and economic benefits.

The incubator has eight major service functions:

1. Registration of enterprises
2. Provision of office space
3. Management of human resources and salaries
4. Instruction in accounting principles
5. Policy implementation
6. Support to tenants in making loan applications
7. Financing
8. Helping businesses apply for Hi-Tech Enterprise Certification by the State

In addition, the following complimentary services support enterprise development:

9. Liaising between enterprises and the market
10. Diagnosing potential organizational problems for the enterprise
11. Implementation of enterprise operations independently of Government involvement
12. Implementation of shareholding in selected tenant enterprises
13. Recruiting and training enterprise managers
14. Organization of exhibitions and demonstrations of new products
15. Support for enterprises in developing international markets

The admission requirements for incubation (again, approximately three to five years tenancy) are based on the following:

- High technology nature of the projects
- Good market potential
- Entrepreneur with appropriate management ability
- Registered capital in excess of US $36,000
- Clearly defined intellectual property rights

The requirements for graduation include:

- Achievement of the following minimum levels of commercialization

Annual turnover	US $600,000
Annual turnover per employee	US $ 12,000
Profit margin	20%

- Development of a competent management team, with complete and effective rules and procedures
- Establishment of a competitive position in the market, with additional products under development
- Strong capacity in dealing with business risks

The incubator plan for the next five years is based on two goals for performance:

1. Nurture five enterprises per year with an annual output value of US $6 million, and two enterprises per year with output valued at US $12 million.
2. Achieve the plan for the employment levels of the incubating enterprises.

Future outputs from this plan over the next five years are expected as follows (Table 6-15):

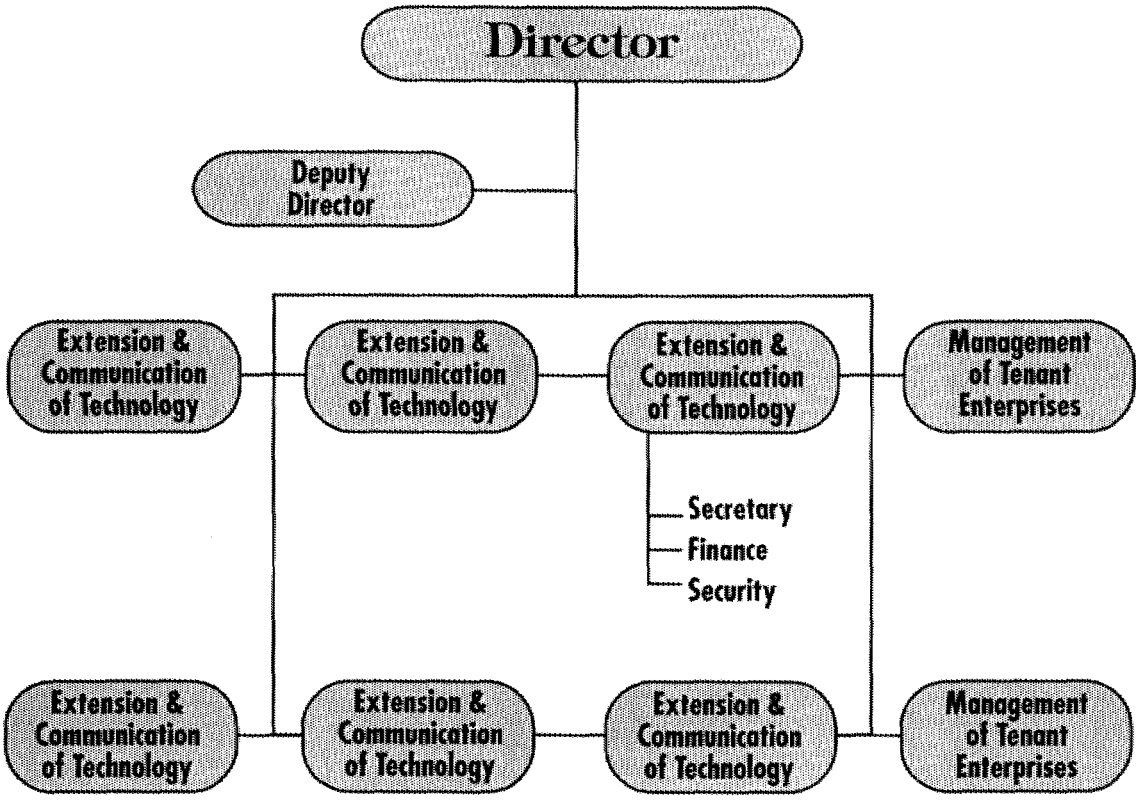
Table 6-15: Shanghai Incubator Future Outputs

	1995	1996	1997	1998	1999
Total output value, US$ millions	$24	$33	$42	$51	$60
Employment	2,500	3,000	3,500	3,800	4,000

Chongqing Hi-Tech Innovation Centre

The Chongqing High and New Technology Industrial Development Zone covers an area of 15,354 square metres. The Centre, established 5 October 1990, employs 41 people to develop science and technology enterprises as part of the TORCH programme. In its five years of operation, the Centre has constructed four buildings (Enterprise, Science & Technology, Business, and Service) providing 21,197 sq. metre of space. The Centre itself occupies 3,500 sq. metre, with 16,697 sq. metre available for S&T enterprises, and 1,000 sq. metre dedicated to related service agencies. These related services include banking, auditing, and legal organizations (Figure 6-5).

Figure 6-5: Chongqing Incubator Organization Structure



The Centre has nurtured 80 enterprises, providing employment for 2,700 persons, building up fixed assets of US $6 million and working capital of US $240,000. A main focus of the Centre is reducing the routine work load of scientists and technicians to encourage them to start and develop new ventures. The services provided include support for the completion of formal applications processes and registration for business licenses. Other forms of support include water, electricity, post, communications, clerical services, photocopying, and security.

The Centre also established a seed fund for new enterprises. To evaluate investments, the seed fund administrators consider, in order of importance, the financial prospects for the business, qualifications of the management, technical feasibility, and market prospects. To mobilize capital for technology-based ventures, the Centre established a shareholding institution, the Credit Bank for Science and Technology, raising financing for technology-based enterprises, while emphasizing investor safety, capital circulation, and profit. The bank has mobilized US $24 million in savings, granting loans of US $12 million. Some 48% of the loans were to S&T enterprises. The final financial aspect of Centre operations involves guaranteeing loans for tenant enterprises, using the assets of the Centre as collateral. These guaranteed loans amounted to more than US $2.4 million for tenant enterprises.

Screening tenant enterprises, and their technologies, occurs via three initiatives:

1. **Chongqing High Technology Inventors Association**: bringing together skilled S&T practitioners who can conduct cost/benefit analyses as well as providing advisory support for (prospective) tenants. National meetings showcasing technology, communications, and exhibits of tenant products and services are manifestations of this initiative.
2. **Technology brokerage**: helping holders of technology to commercialize their latent assets. The Centre helped initiate and complete the transfer and commercialization of over 250 technologies.
3. ***High Technology News***: collecting information on new technologies around the world, the *News* provides a marketing forum for tenant enterprises.

The Chongqing High Technology Innovation Centre provides three areas of support for developing high and new technology ventures.

1. **Space**: The centre provides manufacturing space and logistical services for tenant enterprises. The Centre collects rent at less than 20% of market value, with further reductions for technology-intensive enterprises. It hosts 64 of these enterprises that, according to 1994 statistics, completed 278 project developments representing over US $12 million.
2. **Joint stock companies**: After assessing the management, technology, and market prospects, the Centre will provide not only office space and logistical services, but also short-term working capital and credit guarantees. These enterprises are approved by the Zone, and the Chongqing System Reforming Committee for participation in this programme. The Centre received stock rights in 14 such enterprises, including four certified high and new technology enterprises, and three more which have undertaken key projects of the State and municipal authorities. The Centre provides a variety of services to these enterprises. Some US$319,000 has been invested in these projects by the Centre, representing 53.4% of available registered capital. The Centre currently owns stock in six of these companies, representing projects in communications, medicine, machine-electronics, and environmental protection. State regulations forbid public offerings of stock from these companies, so the Centre assists with financing by purchasing equity. These enterprises developed 86 new products, with 39 projects put into production generating gross sales of over US $8.4 million—an increase of 60% over the previous year. To encourage these enterprises to operate independently, the Centre is involved in attracting new investors so as to reduce the share of public sector equity ownership.

3. **Subordinate enterprises:** These enterprises are owned by the Centre, thus the Centre bears responsibility for any losses incurred. An overhead charge of 5% of total sales is levied by the Centre. Eight enterprises are so classified, of which five graduated and expanded by merging with township-owned enterprises. The three enterprises in the Centre had a gross income of US $500,000 in 1994.

Now emerging from its initial phase, the Centre is directing its attention to improving the software and hardware environment for incubating enterprises. The goals for the next five years include completion of a third office building and construction of a high-level service building for logistical facilities. Technology demonstration laboratories will be established, with general experimental equipment to support tenant enterprises. To move beyond being purely a real estate operation, attention will be directed toward the training of staff and management in the service of high and new technology enterprises.

7 THE CZECH REPUBLIC

7.1 Overview

Prior to World War II, the former Czechoslovakia had a vibrant business sector, where entrepreneurism and private capital both played a role in the national economy. Under the centrally-planned economy during the Warsaw Pact years, however, the emphasis was on large, state-owned industrial works, while small, private businesses were neglected totally—often considered undesirable, if not forbidden altogether. The recent political changes in Central and Eastern Europe have resulted in radical economic and social changes in the new Czech Republic. Return of the state-controlled economy to a competitive market model not unlike the pre-war years is characterized by a massive privatisation process, accompanied by the establishment of numerous small and medium enterprises (SMEs).

SME creation in the Czech Republic is a combination of several processes proceeding in tandem. Small firms are spinning out of large firms, particularly in the science and technology sector. In addition, some medium-sized businesses are being created as a consequence of the break-up of former state enterprises. However, most SMEs appear simply because of a resurgence in entrepreneurship. Entrepreneurial sentiments are a part of Czech culture that survived decades of centralized economic planning, and are the strongest driving force behind the future growth of the economy and the establishment of new businesses in the country.

Public sector economic planning is now moving into a process of supporting, rather than restricting, entrepreneurship. The rise of publicly supported incubators is one attempt to generate small enterprise and employment for a young economy. While the Czech Government is aware of the importance of small and medium companies for both the national economy and the growth of national product, the system for support of SMEs is still in the early stages of development, facing critical constraints in the financing, legislation, and property rights areas.

7.2 Small Enterprise Support

Most current SME programmes were developed by the Czech Government. Other programmes were established either by municipal authorities or by public, private, or academic promoters. The main tools for SME support are as follows:

- National programmes of assistance to small and medium enterprises
- Information and consulting services
- Foreign funding for enterprise assistance
- Business incubators

The success or failure of a business incubator is strongly influenced by the overall situation in the host country. Nurturing and growth of new businesses in incubators has a chance of succeeding only if projects are consistent with the country's overall economic strategies and in accord with other supportive activities. Thus, an outline of basic programmes and services for the support of small businesses in the Czech Republic provides the necessary context for the evaluation of incubator programmes. Ten general programmes exist to provide assistance to SMEs (Table 7-1).

Table 7-1: Current SME Support Programmes in the Czech Republic

Programme	Realization	Access	Conditions
Guarantee	Price-supported guarantee (up to 6% p.a.) for bank credit	SMEs up to 500 employees. The company must be located in the Czech R.	Projects must be either industrial, handicrafts production, trade, general services, or passenger transportation (except taxi), and of regional significance.
Start	Up to US $50,000 for interest payment (max. 4%) over four years	SMEs up to 24 employees. The company must be located in the Czech R.	Same as above
Development	Up to US $167,000 for interest payment (up to 3%) for four years	SMEs up to 500 employees located in Novym Jièín, Bruntál and Karviná	Increase national export capacity. Environmental waste treatment. Create new jobs. Production of sanitary equipment for handicapped citizens.
Asclepius	Up to US $167,000 for interest payment (max. 3%) over six years	Certificates of professional qualification and an affirmative statement of registration as a non-state health facility	Assistance for establishment and further development of outpatient treatment by general practitioners, pediatricians, dentists, and gynecologists. Assistance to pharmacies.
Consult	Up to US $1,000 subsidy for up to 40% of cost charged by a consulting company	SMEs up to 500 employees, located in the Czech R.	Preparation of business plans or programme applications
Region	Up to US $100,000 for interest payments (up to 4%) over four years	SMEs up to 500 employees in 19 selected regional districts where new jobs must be created	The Region Programme is a supplement to: Start, Development, or Asclepius
Regeneration	Up to US $100,000 for interest payments (up to 3%) for four years	SMEs up to 500 employees, located in selected historical towns of the Czech R.	Business plan consistent with the town regeneration programme. The Regeneration Programme is a supplement to: Start, Development, or Asclepius
Special	Subsidy of US $33 per month for each newly recruited employee from selected groups	SMEs up to 500 employees, located in the Czech R.	Proven creation of new jobs for those citizens with difficulty adapting socially. The Special Programme is a supplement to other programmes: Guarantee, Start, Development or Asclepius
Park	Up to US $167,000 in a five year, interest-free loan for up to 80% of the total project expenditures	Czech companies establishing or developing a science or technology park	New park: at least 50% of available area must be pre-contracted. Existing park: at least 70% of space either leased to tenants or pre-contracted.
Transfer	Up to US $33,000, six year, interest-free loan for up to 80% of cost of acquisition of domestic or foreign technology	SMEs up to 500 employees. The company must be located in the Czech R.	Technology or know-how of a high standard. Technology to improve level of existing production. Technology for attaining business plan profitability.

Supported projects (numbering 1,553) received interest payments of US $35.8 million and a guarantee value of US $53.5 million. Only one project was submitted for the Park Programme, and was approved in combination with a supplementary programme, receiving US $23,000 in support.

Information and Consulting Services

Several institutions in the Czech Republic provide information and consulting services to entrepreneurs at the national and regional level. Various regional centres offering information and consulting services to entrepreneurs were established in the last two years.

National Information Centre (NIS) provides information services in all branches of the national economy, science, and technology. Information is distributed on floppy discs, CD ROMs, or is on-line accessible via the user's computer modem connection to the INFONIS database. The Information Centre for Small and Medium Enterprises, part of NIS, offers:

- A database of legal information—PALLAS
- Databases of Czech financial institutions and their services
- Auditors and tax-advisors
- Legal regulations counselling for entrepreneurs
- Business representations of foreign companies
- Information about firms
- Other information services requested by clients

NIS includes the Euro Info Centre, offering extensive databases of domestic and foreign companies, full texts of the Czech Collection of Laws, and materials of the World Bank, EU, and other international agencies.

Enterprise Development Agency (ARP), affiliated with the Ministry of Economy, provides services to small and medium-sized enterprises, organizes seminars and courses for entrepreneurs, and mediates cooperative ventures with partners abroad. These services are focused on:

- Entrepreneurial consulting, including firm strategies and development, marketing, financial analysis, and organizational assistance
- Additional education and training of entrepreneurs
- Mediation of cooperative relations among Czech and foreign partners
- General consultancy, in addition to the preparation and evaluation of business plans
- Solving specific problems with the help of a network of external professionals

The Economic Chamber of the Czech Republic provides:

- Legislative services
- Export-import advising, including international trade procedures and regulations
- Information about fairs and exhibitions in the Czech Republic and abroad
- Professional library services, including specialized publications
- International contacts, including advocacy organizations for Czech firms abroad, organizing meetings between foreign and Czech partners, and provision of trade information

The Economic Chamber further provides consultancy on tariff problems, licensing and certification, and organizes professional training and education for entrepreneurs.

Foreign Sources of Enterprise Assistance

Programme PHARE: PHARE offers substantial SME assistance, including:

- Small loans up to US $33,000 at low interest rates. Programme is accessible by SMEs with up to 100 employees. The company must be located in the Czech Republic and should preferably be oriented toward manufacturing, tourism, or rehabilitation of the environment.
- Consultancy, information services, and professional training for entrepreneurs. This part of PHARE support is based on the establishment of a network of Regional Consulting and Information Centres (RPIC). Centres provide general consultancy for entrepreneurs, market analysis, and managerial assistance.
- Business Innovation Centres: Three BICs were established under the PHARE programme in the Czech Republic in the last three years. The Centres offer space, incubator services, assistance with business planning, marketing, financing, and technology transfer.
- Publicity support: Programme PHARE covers up to 60% of expenses related to participation at exhibitions and trade fairs. Czech companies having up to 150 employees, with a clearly-defined and innovative manufacturing programme, are eligible for this kind of PHARE support.

Czech-American Enterprise Fund (CAEF): CAEF aims to support private enterprises in the Czech Republic through a system of capital participation in particular ventures. The entrepreneur must provide a business plan showing clearly the project's ability to produce revenues. CAEF supports the launching of Czech-American joint-ventures. Financial assistance ranges from US $0.3 to 2.7 million for one project. CAEF also runs, jointly with the Czech Bank of Commerce, a programme of small, low interest loans to SMEs.

7.3 Incubators

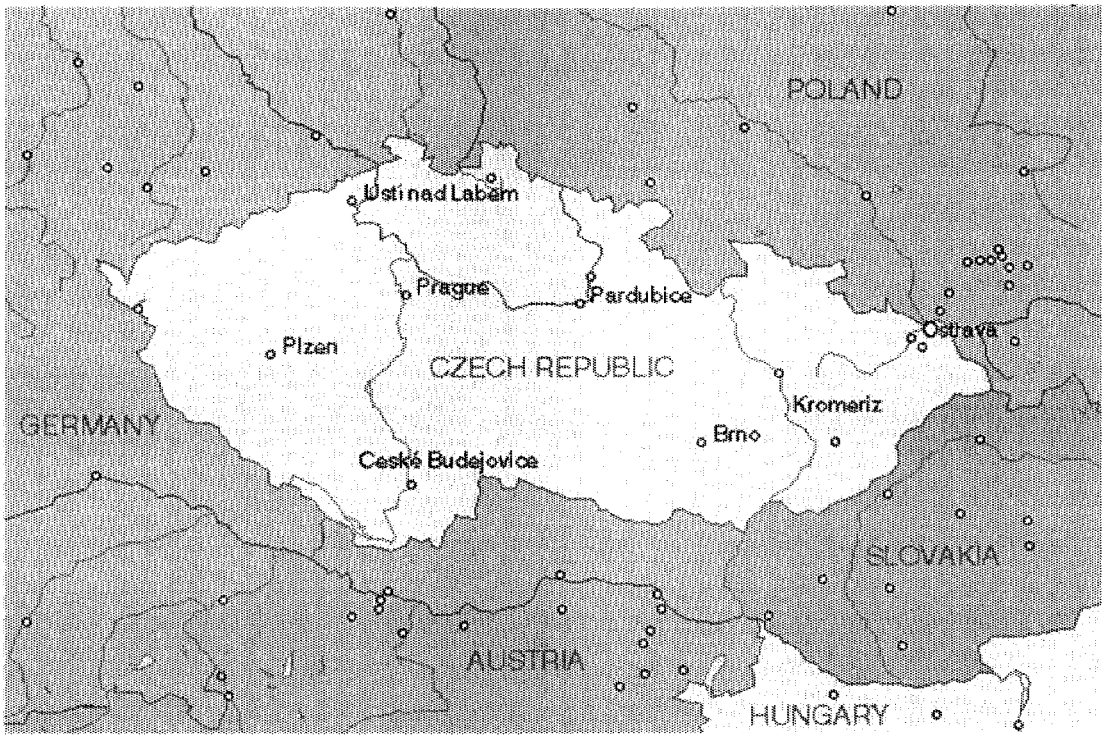
Before World War II, the former Czechoslovakia ranked fifth among the industrially most developed countries in terms of per capita GNP. Under pre-war regimes, the country developed a large research base. R&D spending in relation to GNP was at a comparable level with many countries in Western Europe. Under the post-war, centrally-planned system, however, industry's ability to invest in research and innovation was limited. Much greater priority was attached to meeting short-term production and cost targets. Today, the privatization process is almost complete, with some industrial companies already engaged in the research and development of new processes. The country is currently characterized by a modest technical infrastructure, a highly educated workforce, well-developed research capabilities, and other key elements for the successful development of technology-based enterprises.

At present, 27 projects are in distinct stages of development. The following characterizes Czech incubators:

- Twelve operating parks and incubators have been evaluated successfully in the assessment procedure of the national Society of Science and Technology Parks
- Five parks and incubators are in the various levels of assessment
- Ten projects are in the development stage

The incubators are located in cities throughout the Republic (Figure 7-1).

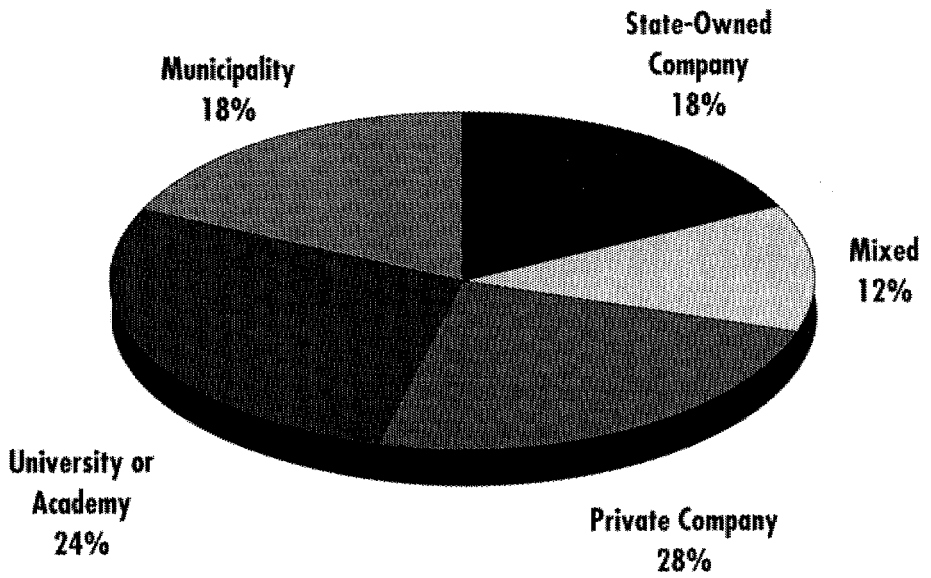
Figure 7-1: Incubators in the Czech Republic



Characteristics

Currently operating incubators are sustained and promoted by a variety of sponsors (Figure 7-2). The 17 active incubators mentioned have balanced sponsorships, with significant participation by the private sector.

Figure 7-2: Promoters of Business Incubators



The number of operating incubators is small for statistical analysis, with roughly three to five incubators being added each year since 1991. Most facilities claim to be technology-oriented incubators, but in practice usually admit other businesses as well.

Operating Business Incubators

By September 1994, 17 business incubators were operating in the Czech Republic. Such incubators, sometimes called "innovation centres" or "parks," serve as facilities for the launching and growth of new enterprises. These are outlined below:

Business Innovation Centre of the Czech Technical University (BIC CTU), Prague, was founded under programme PHARE in 1991, and offers more than 4,000 sq. metres of space and complex business services to entrepreneurs. It accommodates 19 companies, including 11 markedly innovative enterprises. BIC CTU is a member of the European Business and Innovation Centre Network (EBN). Promotion of enterprise start-up and development, especially in the field of civil engineering, electrical technology, architecture, and construction engineering, is the mission. Preference is given to high-tech companies.

Technology Park of the Academy of Sciences (TP AS), Prague, was established in 1993 with the help of UNIDO. TP AS is designed as the incubator for small science-based organizations. It helps accelerate the commercialization of innovative technologies developed by over 4,000 scientists and researchers of the Academy. TP AS offers 1,500 sq. metres of office space, technology halls, and laboratories. Space for rent will reach 4,000 sq. metres in the first half of 1996. It provides space to 10 innovative companies. Preference is given to projects with close links to research programmes of the Academy.

Science and Technology Innovation Centre of the Faculty of Building Engineering of the Czech Technical University (STIC), Prague, supports start-ups of small companies active in the construction and building sector. The Centre offers about 1,000 sq. metres of rental space and a variety of services to its 20 tenants. STIC is also active in the technology transfer area and helps create cooperative links between faculty members and the building industry. The admission process focuses on the development and implementation of new technology.

Innovation Technology Centre (ITC) VÚK Panenské Brezany. The privatisation of the former state Research Institute of Metals resulted in the establishment of this limited shares company. ITC performs research and development of new materials with applications in the electronics and transport industry, and offers more than 13,000 sq. metres of space, including technology halls, workshops, laboratories, offices and business services. Located in a small village near Prague, ITC offers the pleasant environment of a large castle park at affordable cost. The Centre hosts seven enterprises, admitted based on their business plans, with preference given to companies active in the commercialization of results of new materials research.

AGRIEN s.r.o., Ceské Budìjovice, was founded by a private consortium in 1992. Located adjacent to the campus of the Institutes of the Academy of Sciences, it has access to specialists in entomology, parasitology, molecular biology, landscape ecology, soil biology, and hydrobiology. AGRIEN aims to enhance creative collaboration between scientists and business, in cooperation with South Bohemian University located in Ceské Budìjovice. A second objective is the attraction of foreign companies, especially from neighbouring Austria, by providing specialized services—e.g. translation, conference facilities, training tools, and contracts with research institutes. The city is situated in South Bohemia, about 120 km from Prague. The incubator's main assets are the availability of space, proximity to a strong research base, and extensive human and equipment resources. The 13 companies located in the incubator were selected with preference given to those having established links to research performed at the Academy Institutes or South Bohemian University. In addition to this facility, AGRIEN also operates a business incubator with 1,200 sq. metres of office space and workshops.

Innovation Centre of Electric Energy (ICEN), Klasterec nda Ohri. ÉEZ Elektrárny Prunéøov plc, an organization responsible for power production and supply, founded ICEN in 1994 to stem the tide of unemployment resulting from industrial reconversion in the North Bohemia region. ICEN activities are coordinated with regional development plans and emphasize the need for support to small businesses (not exclusively high-tech). ICEN provides about 1,500 sq. metres of offices and workshops, and accommodates a number of small companies, providing basic business services. Admission preference is given to companies producing services to meet regional needs and demands.

Business Incubator, Pardubice, was created by the city of Pardubice in 1993. The incubator offers about 10,000 sq. metres of rental space and some business services to 36 small enterprises, most of which produce traditional handicrafts rather than high-tech goods and services. Recent discussions, however, between City Hall and East Bohemia University (an institution known for its specialists in chemistry), have suggested taking steps toward setting up a technology park. The idea of a high-tech incubator specializing in chemical-oriented enterprises is an appropriate local development move, since large chemical plants are situated around the city. Admission requires a positive evaluation of the business plan.

Business Innovation Centre (BIC), Brno was established in 1991 under an EBN project. BIC Brno consists of the pilot centre in Brno and a few satellite centres in the region. BIC Brno works partially as an incubator without walls, providing services (except space) to clients in the South Moravia region. The incubator cooperates closely with City Hall Brno, the National Bank, the Technical University of Brno and, particularly, with the Brno Fair and Exhibition. The major partners of the incubator established the BIC Brno Foundation to finance incubator activities. BIC Brno has about 2,000 sq. metres of rental space available in the Brno pilot centre. The incubator offers complex business services to 16 companies admitted to the BIC and to dozens of companies located in the region. Admission requires a positive assessment of the business plan.

TEXING Brno, is a state-owned company housing 26 small enterprises in a 9,000 sq. metres facility. TEXING offers specialized support for machine engineering, electronics, industrial design and promotion through a wide range of common and special services. The privatisation of TEXING is underway and by the end of 1995 it will become a privately-held company with limited liability. A positive assessment of the business plan is required for admission.

Business Incubator PINK, Kromeriz, was created by the city of Kromeriz in1991. Incubator tenants specialize in the area of environmental programmes such as recycling plastic wastes and the development of alternative sources of energy. A minority of companies in the incubator develop special electronic devices. PINK has 1,200 sq. metres of rental space and is fully occupied, with 11 tenants accessing a comprehensive range of services, including financial advising and marketing. Admission requires a positive assessment of the business plan.

Information and Management Centre (IMC), Zlín, was established by a group of private citizens in 1991. IMC's main activities include the development of information systems using UNIX, as well as consulting, managerial services, and complex technology development for the plastics and rubber industry. IMC created an incubator for small companies featuring a wide range of entrepreneurial programmes. The total area of the incubator is more than 5,000 sq. metres, housing 61 companies, a small number of which (five) are high-tech. IMC has sufficient space for expansion of incubator activities. Admission is based on the positive assessment of the business plan.

Technology Innovation Centre (TIC), Ostrava. The image of the Ostrava region as the "steel hearth of the Republic" and an old mining centre, is strongly affected by the structural changes in the Czech economy. The closure of mines in recent years led to a loss of thousands of jobs—a trend that is expected to continue. This also resulted in lay-offs in sectors that supply the mining industry. The creation of new and secure jobs is one of the

basic goals in the economic restructuring of the region. Proposed measures involve the creation of support systems for the establishment and development of new small enterprises. Under this programme, a local steel works, Vitkovice plc, along with the City of Ostrava, the Economic Chamber, and the North Moravian Economic Union, established the Technology Innovation Centre, or TIC (1994). TIC was designed as a business incubator supporting a broad range of companies, and helping to create a new entrepreneurial culture in the region. The incubator provides space and service to 25 small companies in a 9,500 square metre facility. A positive assessment of the business plan is required for admission.

Technology Park INCEL, Prague. INCEL, the Innovation Centre of Electronics, houses the project which is privatizing the largest Czech state-owned research institute of communication technologies, VÚST-TESLA. The original privatisation project was based on the Czech model of coupon privatisation, which occurred in the second wave of State sell-offs in 1994. That project was replaced by the so-called "envelope method," i.e. a direct sale to the company bidding the highest price. The winner of the contest, Company Software T-602, planned to establish a technology park with an orientation toward electronics and software development. According to available information, Company Software T-602 did not pay the required price to the National Property Fund. As a result, the project was returned to the Czech Ministry for Privatisation, with its current status uncertain. Meanwhile, small electronics companies were spun out of the former research institute, and these and other companies—not exclusively electronic—were admitted to INCEL. Over one hundred small companies reside in INCEL's 20,000 square metres, representing a wide array of business activities. The future existence of the technology park and its incubation activities depends on further privatisation in the state-owned economy. Companies active in the sectors of electronic research, development and manufacturing are preferred tenants.

Research Development and Education Centre (VVVC), Prague, offers very limited space (about 300 sq. metres) and a few basic services. VVVC is focused on the education of civil engineering students and post-graduates, rather than on the support of business start-ups. The management of VVVC reports five small companies having short-term lease contracts. Companies can lease a space equipped with basic machine tools. No admissions criteria are published.

Business Innovation Centre (BIC), Plzeò, was established by the City of Plzeò as a limited company in 1992. The incubator is housed in 300 sq. metres of space in a building in the centre of Plzeò, providing office space along with legal, financial and commercial advisory services. Small conference facilities are available to the eight tenants, all of whom were admitted based on a positive assessment of their business plans.

Centre of Technology and Education, Dvur Kralove and Labem, is an independent business unit of the state-owned Research Institute of Textile Works. It specializes in R&D, technology transfer, production of fine chemicals, and education, all for the textile industry. The Centre offers about 500 sq. metres of mixed space (offices and production units), enhanced by legal, licensing, patent, marketing, and technology advisory services for its six small enterprise tenants. Companies active in the textile industry and in environmental protection are preferred.

Regional Innovation Centre (RIC), Dobrá, was established by the Research Institute of Iron Metallurgy in 1991. The primary aim of the RIC is to support companies active in the development and commercialization of new materials. A series of discussions with the nearby city of Frydek-Místek have recently begun to consider the involvement of other regional institutions in the project. The RIC has more than 8,000 sq. metres of rental space including production halls and stores, as well as a complex system of services offered to more than 30 tenants. Admission is based on a positive assessment of business plan, with preference given to companies commercializing the results of their material research.

Planned Business Incubators

A number of innovation centres, technology parks and similar projects are planned in the Czech Republic. Promoters of individual proposals come from several types of organizations:

- Municipal authorities, keen to change the entrepreneurial structure of the region and to solve existing or potential unemployment problems;
- Universities or research institutes, with the aims of enhancing the value of their land or buildings, and of improving the adoption of research results by the productive sector;
- Large industrial corporations that support the spin-off of small enterprises which provide special services and products to the sponsor.

A question arises about the feasibility of many projects and their potential to succeed. The projects showing signs of positive development are reviewed below.

Czech Technology Park, Brno, is at an advanced stage in terms of property development. A company was created with City Hall Brno, the Technical University of Brno and Bovis, and a private British developer as shareholders. The project aims to provide 120 hectares of land and buildings to business and industrial companies. In the first phase, one 3,000 sq. metre building was finished with state-of-the-art offices and is now partially rented to foreign companies (Siemens, Axe, Transport Technik Demag, and Silicon Graphics). In the next stage of development, the space for research, light production, and storage is planned to occupy 25,000 square metres. The establishment of the business incubator was included in the original project design of the park. The idea of the incubator is particularly supported by the University, which hopes to launch a number of spin-off ventures. It is scheduled for completion in 1996.

Prague Technology Park, Prague, is a project of the City of Prague, in cooperation with the cities of Dolnì Poèernice and Bìchovice. This Government initiative is complemented by a group of recently privatized research institutes located in the eastern end of Prague. The total available area is more than 60 hectares, but additional land might become available for development. It is hoped that a management company will be created soon and a property developer will be selected in the first half of 1996. Primary assets include the ready availability of space and the proximity of several research institutes. The project also involves the establishment of a technology business incubation centre.

Prague Science Park, Prague, is sponsored by the consortium PIAS (Prague Institute of Advanced Studies). The other project promoters are the city district Prague five and the nearby hospital Motol. The project received support from the European Union in its technical and financial feasibility studies, and for project marketing. The Science Park is to be developed to international standards, with the first construction phase beginning in 1997. The plan also includes the development of a business incubator for small, science-related companies.

Business Centre Litvínov, is to be developed in North Bohemia by the City Hall and its foreign partner, the Regional Development Agency Brugge (Belgium). The Centre aims to establish business relations between Czech and Flemish entrepreneurs. This scheme has received financial support thus far mainly from the Belgian side.

Innovation Centre, Ústí and Labem, is being organized by the Research Institute of Inorganic Chemistry. Future tenants are expected to be small companies linked with the research programmes of the Institute. A rental space of 5,000 sq. metre will be available to tenants.

Closed Business Incubators

Since the political changes in 1989, considerable interest has arisen in developing business incubators—often motivated, unfortunately, by the belief that they are a universal remedy for treating all the economic ills of a

region. The directory of projects of business incubators included 44 schemes in 1993. As mentioned earlier, 17 incubators are actually in operation, and five are in various stages of development. What this means, however, is that 22 business incubator projects (50%) have been terminated for various reasons, not the least of which may be unrealistic expectations, coupled with inadequate support.

Objectives

Sponsors of business incubators in the Czech Republic are drawn from several types of organizations, each harbouring significantly different objectives:

- Large private companies (28%), using the incubator either to provide space for their own spin-offs or to stimulate joint-ventures with foreign partners;
- Universities and research institutes (24%), encouraging technology-based spin-offs and providing research capabilities and services to incubator tenants;
- Municipal authorities (18%), seeking to develop the private sector;

Table 7-2: Incubator Objectives-Czech Republic

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Entrepreneurial Detection	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Enterprise Creation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Employment Creation						X	X					X			X		X
Wealth Creation	X	X			X	X	X			X		X					
Regional Development					X	X	X	X		X	X	X			X		X
Technology Transfer	X	X	X	X	X			X	X				X	X		X	X
Research Commercialization	X	X	X	X	X			X	X				X	X		X	X

Key to incubators listed in table 7-2 and 7-3

1. Business Innovation Centre, Czech Technical University, Prague
2. Technology Park, Academy of Sciences, Prague
3. S&T Innovation Centre, Czech Technical University, Prague
4. Innovation Technology Centre-VÚK, Panenské Brezany
5. AGRIEN s.r.o., Ceské Budêjovice
6. Innovation Centre of Electrical Energy, Klásterec nad Ohrî
7. Business Incubator, Pardubice
8. Business Innovation Centre, Brno
9. TEXING, Brno
10. Business Incubator PINK, Kromêriz
11. Information & Management Centre, Zlín
12. Technology Innovation Centre, Ostrava
13. Technology Park INCEL, Prague
14. Research, Development & Education Centre, Prague
15. Business Innovation Centre, Plzeñ
16. Centre of Technology & Education, Dvur Králové nad Labem
17. Regional Innovation Centre, Dobrá

- State-owned companies (18%), seeking to enhance the value of their under-utilized land and buildings;
- Promoters (12%), often a consortium of some or all of the above.

Given this range of sponsors, a lack of unanimity on incubator objectives can be expected. Consensus, however, has been reached regarding the role of incubators in the identification of new entrepreneurs, and also in broadly defining their mission as the creation of new enterprises—although what kind is certainly in question (Table 7-2).

Operating Characteristics

An incubator can be characterized by the space available, services provided, and results derived from the application of these services to the needs of the entrepreneurial community.

Space provided by incubators is the simplest measure for their characterization. Czech Republic incubators vary widely in both their available space and the degree to which facilities are fully occupied. The 2,230 sq. metres median rentable space is very large by international standards, and gives no hint of the actual range of 300 to 21,000 sq. metres for individual incubators. Similarly, the facility utilization, as measured by the percentage of space rented, ranges from a low of 12%, to several units fully occupied.

Services are also key to the business incubation concept, particularly in the development of new and early-stage ventures (Table 7-3).

Table 7-3: Incubator Services—Czech Republic

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Business Plans	X	X	X	R	X	X	X	X		X	X	R			X	X	R
Technology	X	X	X	X		R		X	X	X	X	R	X	X		X	X
Finance	X	R	R	X	X	R	R	X	X	R		R	R		X	X	X
Marketing	X	X	X	X		R	R	X		X	X	R	R		X	X	X
Legal				X	X	R	R	R	X	R		R	R		R	R	X
Patents	X	R	X	X	R	R		R		R		R			R	R	R
Training	R	R	X		R	X	R	X		X	X	R	X	X	X	X	X

Notes: X = provided by or through incubator staff; R = provided by referral; for key to individual incubators, see Table 7-2.

Results

The Czech incubators developed a significant record of enterprise creation during their early years of operation. The record on employment however, is insufficient to draw any conclusions.

7.4 Conclusion

The total number of business incubators in the Czech Republic, as well as the steady rate of new incubator formation in the last four years, indicates few problems with the modality in the Czech context, despite certain shortcomings and constraints. Most facilities claiming to be business incubators simply offer space, telephones, faxes, and some basic office equipment. The relationship between the facility owner and small companies resembles that of landlord and tenant, with little assistance given in the areas of management, marketing, and finance. Another characteristic of the business incubator should be the gradual escalation of rental charges so that the tenant firm finds graduation to be in its economic interest after a period of time (usually three years). How-

Table 7-4: Incubator Results—Czech Republic

Incubator	Enterprises Created: Total	Enterprises Created: Technology Related
• Business Innovation Centre, Czech Tech.	19	11
• Technology Park, Academy of Sciences	10	8
• S&T Innovation Centre, Czech Tech. U.	21	6
• Innovation Technology Centre-VÚK	7	3
• AGRIEN s.r.o.	14	5
• Innovation Centre of Electrical Energy	10	6
• Business Incubator	36	7
• Business Innovation Centre	16	11
• TEXING	26	9
• Business Incubator PINK	11	6
• Information & Management Centre	61	5
• Technology Innovation Centre	25	15
• Technology Park INCEL	133	45
• Research, Development & Education Centre	5	5
• Business Innovation Centre	8	3
• Centre of Technology & Education	6	4
• Regional Innovation Centre	32	4
TOTAL	440	153

ever, in the Czech Republic, owners of real estate usually try to negotiate the highest possible rent from the beginning. This attitude is typical of incubators promoted by private concerns but, surprisingly, also of some State-owned facilities. Such exorbitant up-front lease costs may hinder the development of tenant businesses with cash flow problems early in their development cycle.

Despite these problems, however, the incubator, as an economic development modality, continues to provide a home for the development of native Czech business talent. As the economy in this former Eastern Bloc country continues to evolve from command and control to a market basis, incubators are reanimating entrepreneurial expressions of talent long suppressed by post-war regimes. The system of national programmes of support for small and medium-sized businesses offers an impressive list of possibilities, and the total number of supported projects (1,553 in 1994) is high.

The process of establishing and operating technology and business incubators in this country has specific features. In Western Europe, incubators are a powerful instrument of regional development, supporting small enterprises via substantial direct or indirect State support. In the Czech Republic, the lack of State support is attributable to the relatively advanced state of the economy. Unemployment is low, less than 1% in Prague. This situation, however, is artificial, and may change soon. The privatisation of state enterprises is almost complete and new owners will be expected to increase production efficiency and output. A resulting general rise in unemployment is expected and the role of incubators as a useful tool for new business development will strengthen.

To sum up, the discussions with entrepreneurs and managers of incubators generate some basic conclusions regarding the modality in the Czech context:

- Some facilities in the Czech Republic claiming to be business incubators are actually multi-tenant buildings leasing space in a traditional manner. They do not offer complex, value-added business services and do not work regularly with clients.
- Indications of strong performance were detected in two university-connected incubators. The University of the Academy of Sciences is not commercially driven and can afford to provide free premises for both these incubators, suggesting the modality could be even more successful if there were greater supports built into the present norm of freely negotiated rents.
- Over the next five years, the income projections of privately-owned, for-profit incubators is unrealistic, given the current state of evolution in the Czech economy.
- Western experience with business incubators should be transferred very carefully to the Czech Republic due to its unique social and economic climate.

7.5 Case Studies

Business Innovation Centre of the Czech Technical University (BIC CTU), Prague

Founded under programme PHARE in May 1991, BIC CTU is an independent, non-profit institution affiliated with the Czech Technical University. The University provided at no cost the premises of the former Military Department (estimated value about US $2 million). The PHARE contribution in the first year was US $130,000, used mainly for purchase of office equipment and personnel training, while the University covered the cost of refurbishing the existing premises (US $130,000). This primary funding was supplemented by US $27,000 provided by the Ministry of Economy. More than 4,000 sq. metres of offices and workshops are available. Basic services offered include telephones, fax machines, photocopying, meeting rooms and classrooms, while special services extend support to the development of business plans, financial advising, and contacts to research teams of the Czech Technical University.

Positive assessment of the business plan is the basic condition for acceptance of the company to the incubator. Entrepreneurial teams with the potential for cooperative interaction with the University (or University spin-offs) are preferred. Tenants of the incubator leave the premises typically after three years.

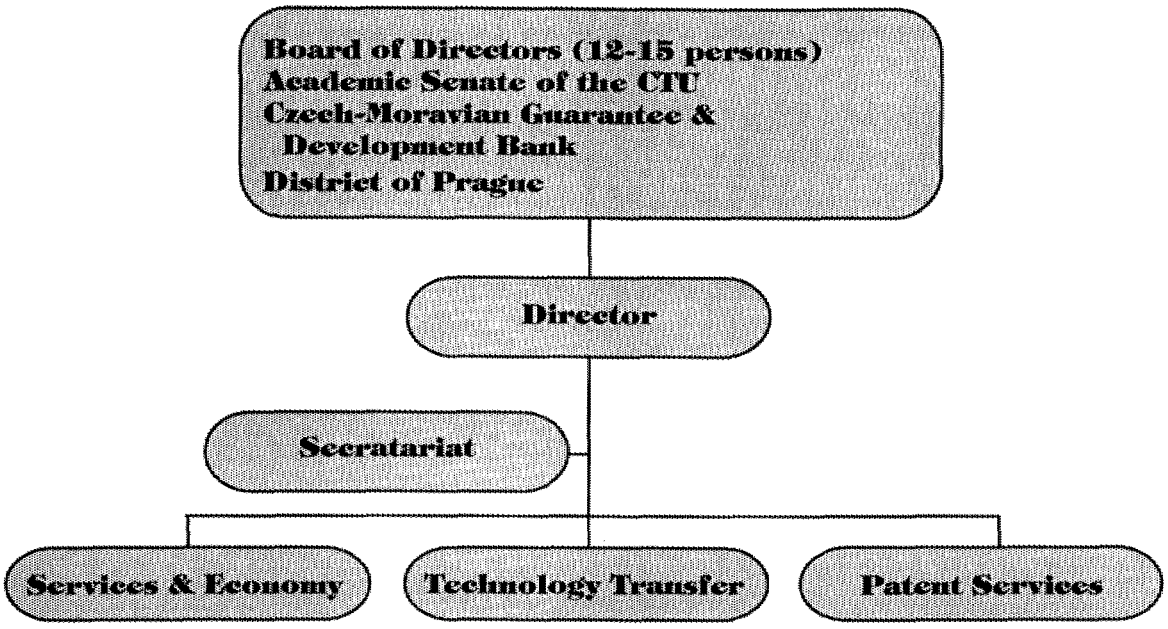
The main objectives of the incubator are to promote enterprise start-up and development (especially in the field of civil engineering), electrical technology, architecture, and construction engineering. BIC CTU also assists in the development of cooperative links between university and industry. The BIC CTU management is responsible to its Board of Directors. The incubator has 11 management and support personnel (Figure 7-3).

Development plans include renovation of existing buildings to meet international standards, and building 15,000 sq. metres of new rental space, as well as the improvement of technology transfer activities and better cooperation with research teams at the University.

The following performance indicators were used for short-term evaluation of the incubator:

- **Effective marketing and entrepreneur detection:** The incubator typically receives eight to ten inquiries annually from potential entrepreneurs. Occupancy in the BIC CTU exceeds 95%.
- **Matching of admissions criteria by tenants:** There are currently 19 companies in the incubator. The majority of these are technology-oriented (11) while others offer various business services (six), and two companies are engaged in traditional crafts.

Figure 7-3: BIC CTU Organizational Chart



- **Enterprise creation:** The incubator has served 30 companies since its establishment in 1991. Nineteen companies have commercialized various types of technology in the areas of electronics, holography, internal combustion engines, and special devices for environmental monitoring. Outside contractors provided the support services necessary for these ventures.
- **Employment creation:** Approximately 150 jobs have been created since 1991.
- **Failure rate:** The failure rate of participating companies is 10%. Three companies terminated their business activities—one joint venture was closed by the foreign (French) partner, one service company went bankrupt due to internal personnel problems, and one contract was terminated by the BIC because the company did not pay the rent.
- **Financial operation:** The business incubator at the Czech Technical University had operating costs of US$200,000 in 1994. Most of these costs were covered by charged services (45%) and rental income (30%). A significant contribution (15%) came from Programme PHARE. BIC CTU received a grant (4%) from the Ministry of Economy, while the University covered the renovation costs for existing premises (6%).

Czech Technical University is the premier institution in technical sciences in the Czech Republic. The establishment of the BIC CTU, it is hoped, will introduce a new opportunity for private sector collaboration with the University. The main advantage of the association to the incubator is the strength and widely respected image of the Czech Technical University. The incubator programme connects entrepreneurs to University faculty and vice versa. The evaluation of incubator activities indicates that the expectations of the University have a good chance of being achieved. BIC CTU will very likely become a self-sustaining operation soon.

Technology Park of the Academy of Sciences of the Czech Republic (TP AS), Prague

The Technology Innovation Centre was established with the assistance of UNIDO in February 1993 and became the Technology Park of the Academy in August 1994. TP AS is a consortium of 12 research institutes at the Academy, all operating as a small independent company. The consortium members (as of August 1995) include the Institutes of: Chemical Process Fundamentals, Physical Chemistry, Organic Chemistry and Biochemistry, Microbiology, Experimental Botany, Plasma Physics, Physics, Nuclear Physics, Hydrodynamics, Thermomechanics, Scientific Instruments, and Information Theory and Automation.

The Academy provided the physical space, while UNIDO covered the cost of the feasibility study, (prepared by foreign experts) and supported study tours for the incubator management (about US $35,000 in total). The Academy contributed another US $50,000 in the first year for purchase of office equipment and basic renovation of existing premises. More than 1,500 sq. metres of mixed-use offices, technology halls and laboratories are available, with space for rent totalling 4,000 sq. metres in the first half of 1996.

Basic services offered are: telephone, fax machines, photocopying, meeting rooms, classrooms, mail handling, and security. Special services include: development of business plans, marketing services, accounting, and links to research teams at the Academy of Sciences.

Three admissions criteria are used to judge the acceptability and readiness of applicants for the incubator: possession of a technology-related product or service, existing (or potential for) cooperative links to the research programmes of the Academy, and possession of a viable business plan. The programme is designed to help launch new ventures, which will typically graduate in three years. However, some companies may stay for longer periods, depending on the extent to which they continue to meet the maintenance criteria, demonstrate growth, and interact with the research programmes of the Academy.

Technology Park is designed as the centre for technology transfer to, and the incubator for, small technology-based companies. The creative environment of the Park, coupled with its strong science base, enables successful start-ups of innovative enterprises, with high-tech projects coming to market fruition over the long term. Management is responsible to the Board of the Technology Park. The Board consists of representatives of 12 research institutes that are members of the consortium. The Park is operated by a team of 13 (Figure 7-4).

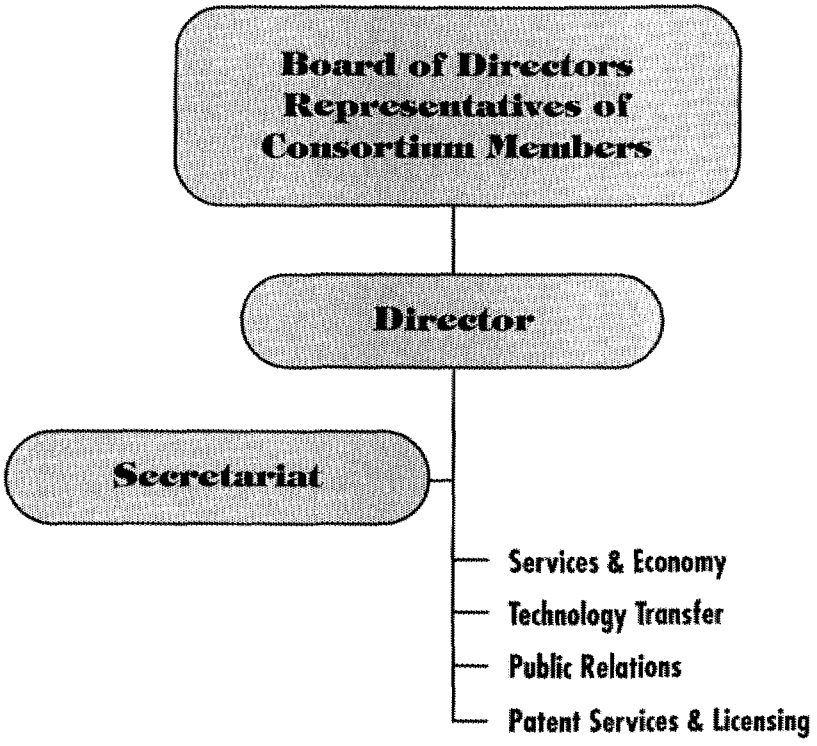
The operations of the existing high-tech incubator were positively evaluated by the Academy. The idea now is to establish a network of specialized incubators for knowledge-intensive companies. This process will produce a "multi-site high-tech business incubator" (MHTBI) with individual incubators collaborating with corresponding research facilities at the Academy. The establishment of three specialized incubators is planned for the first phase:

- An incubator specializing in chemistry, chemical engineering, biochemistry, macromolecular chemistry, industrial processes and environmental technologies, located in Prague (this incubator is an extension of the existing incubator);
- An incubator specializing in microbiology, biotechnology, genetics, and physiology, located in Prague ;
- An incubator specializing in physics, measurement techniques, physical chemistry, telecommunications, computer science, and new materials, located in Prague .

This network of specialized incubators will feature about 40 high-tech companies and a staff of 15-20 working in the area of business services, training, and technology transfer. The full structure of services for entrepreneurs in the incubator is not yet fully developed. The professional infrastructure of business services (marketing, licensing, advisory services, and training) to be made available to tenants of MHTBI has to be created. The Technology Park must develop technology transfer services to bridge the existing gap between industry, SMEs and science. Primary recommendations for the Park are to:

- Transfer knowledge created at the Academy to business;

Figure 7-4: Technology Park AS Organizational Chart



- Provide a supportive environment for small, knowledge-intensive companies through value-added production or services;
- Stimulate joint research projects with participation of academic and industrial partners, in line with industrial needs.

TP AS will closely cooperate with the commercially oriented Prague Technology Park (PTP), an ambitious and large project developed by the City of Prague. MHTBI will serve as the qualified source of small, innovative enterprises for the PTP.

Short-term performance indicators can be used for assessment of the operational and financial performance of the Technology Park incubator's activity:

- **Effective marketing and entrepreneur detection:** The incubator receives typically 10-15 inquiries annually from potential entrepreneurs. Occupancy in the incubator is almost 100% and further space is needed since a queue of seven companies with matching admissions criteria awaits entry.
- **Matching of admissions criteria by tenants:** 10 companies are in the incubator, a majority are technology-oriented (eight), including five Academy spin-offs, while another two offer business services (marketing, personnel recruitment, business advising).
- **Enterprise creation:** The incubator has served 12 companies since its establishment in 1993. Most technology-oriented companies served were established by the former researchers of the Academy, or have evolved from research at the Academy. Companies are from various sectors, for example: production of fine chemicals, waste water treatment, development of communication technologies, manufacture of modems, development of processes for the food industry, and production of special electronic devices.

- **Employment creation:** Approximately 60 jobs have been created since 1993.
- **Failure rate:** The failure rate of participating companies is about 15%. One joint venture was closed by the foreign (British) partner, one contract was prematurely terminated by the Technology Park due to an unacceptable change in the company's management orientation.
- **Achieving a financially self-sustaining operation:** Operating costs were US $67,000 in 1994. A majority of this amount was covered by charged services (13%), rental income (57%), and annual membership dues (17%). Membership dues are paid by the 12 institutes of the consortium who contribute US $2,700 each. UNIDO provided 12% of the support for organizing the international conference on technology transfer.

The financial data for 1994 clearly show that Technology Park is approaching self-sustaining operations. Only the UNIDO contribution to the budget for the international conference was recorded. Annual membership dues paid by sponsors ensure full, free-of-charge services for its tenants.

The Academy of Sciences of the Czech Republic is the strongest science institution in the country. The basic goal of the Academy is to execute basic research at international standards, with the interactions between science and industry, and support of small science-based businesses seen as important organizational priorities. The incubator operating inside the Park received significant indirect financial support from the Academy through the provision of space. The incubator has strong prospects for producing and developing high-tech companies.

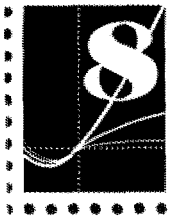
Evaluation of the incubator activities shows that it fulfils the performance criteria. Operating costs are covered by income, and the incubator offers attractive rental space, including offices, laboratories, and technology halls. The demand of companies exceeds space possibilities—as a result, the incubator will almost triple its available space in 1996. The existing system of services for incubator tenants has to be extended and improved. Given its successes, however, the incubator at the Academy could serve as a model for the establishment of similar incubators at other academies in former communist countries.

Technology Centre "Golden Hands", Prague-Letnany

In contrast to the two previous successful examples, this section illustrates a ***closed*** incubator project in the Czech Republic. The technology centre "Golden Hands" was developed in 1992 by the aeronautic factory Letov, which specializes in manufacturing military planes. The factory is adjacent to an aeronautical research and test institute. The incubator site offered a large area of land available for new developments within an existing industrial complex, with the parcel connected to the railway and near the highway encircling Prague. Advanced and fully equipped design, test and production facilities were available to potential partners. The total usable area for development was eight hectares.

The management of the privatized aeronautic factory Letov, in cooperation with the research institute, formulated the project aim of "encouraging new businesses and providing quality business and marketing support services on the site". The project was elaborated in cooperation with a British consultant, and a promotional campaign was initiated to attract potential clients. The director of the Centre was sent to the United States to learn from the experiences of selected incubators.

Quite unexpectedly, in the advanced stages of the project, the Board of Directors decided to close the facility. The management team was replaced by one person, and the project became a simple real estate operation, without any value-added business services. The reasons for this sudden shut down are not clear. The main cause may have been exaggerated expectations of rapid commercial success. Management seemingly expected quick detection of suitable companies in the very specialized area of aeronautic production. Realistic prospects for local business participation were not examined, and the in-kind effort needed for the establishment of an incubator in the local economy was not properly considered.



MEXICO

8.1 Overview

Historically, Mexican industry developed in the context of a protectionist economy. Sheltered to a degree from fluctuations in the world market, national development plans emphasised the establishment of complex industrial infrastructures, neglecting the needs of SEs. The Mexican economy, on the whole, was characterized by a high dependence on imports and little emphasis on exports. In addition to a lack of small enterprise support from the Government, large industries did not typically develop a solid relationship with SEs as competitive suppliers, thus limiting the SEs' markets to more traditional sectors such as handicrafts and small retailing.

The North American Free Trade Agreement (NAFTA) has resulted in a major effort in Mexico to reorient industry towards international markets, and to fortify technological capacities through open competition. Given their history, SEs are not sufficiently competitive at present to grow in the environment created by these new rules. In this study, participants attributed the following obstacles to the increase of their market share:

Table 8-1: Attributed Obstacles to Increasing SE Market Share—Mexico

Obstacle	Survey Response
Lack of technology	28%
Lack of information	24%
Limited market	24%
Limited competence in dealing with big companies	18%
Lack of adequate supplies	6%

The financial crisis in December 1994 widened the gap between SEs' present position and their becoming more competitive in the context of a global economy. The devaluation of the peso shocked businesses throughout the national economy. During the first three months of 1995, unemployment rose to 5.7% of the economically active population (897,000 jobless people), representing 44% of the total number of unemployed during 1994. Automotive industry sales dropped 66.6% during the first three months of the year, as compared to the same period in 1994. Interest rates continue to be excessively high, forcing numerous renegotiations of bank debts on the part of both families and companies.

To stem the tide of joblessness, the Government initiated temporary employment programmes involving over a half-million people in 250,000 labour-intensive projects. These temporary programmes were a necessary measure, but did not interfere with post-NAFTA development initiatives such as the Government's support of maquiladoras—2,089 manufacturing plants along the US border, employing 563,954 people in product assembly.

The economy overall in Mexico is concentrated in food processing, metal industries, mechanics, and the manufacture of such goods as textiles and footwear. Firms are characterised as follows (Table 8-2):

Table 8-2: Mexican Enterprises

Industry Size	Number of Employees	Thousands of US$ Revenue	Percentage of Firms
Micro	1 - 15	0 - 150	90.9
Small	16 - 100	150 - 1,500	7.3
Medium	101 - 250	1,501 - 3,333	1.0
Large	251+	3,334 +	0.8

Incubators in the Mexican economy are a very recent development. Ten facilities, all on average less than two years old, are working with hundreds of SEs. These incubators have got off to a strong start, attracting US $6.48 million in initial capital. In many cases, the initial investment included both development of custom-built physical facilities and working capital. Most of the incubators are linked to universities and research centres, and focus on developing technology-based companies mainly in electronics, software, food services, aquaculture and ecology services. Half of the tenant businesses were started by researchers, faculty or students.

8.2 Small Enterprise Support

A number of programmes were created over the years to support the development of the small enterprise sector (Table 8-3).

In addition to these continuing programmes, the Mexican Government implemented a new economic strategy in May 1995 in the wake of the currency crisis. This strategy is targeted at the economy as a whole, but will also have implications for SEs and their operating environment. Among its features are:

- Promotion of domestic saving capacity through fiscal reform
- Stabilisation of the economy to provide a favourable climate for investors
- Continuing to apply a policy of open markets
- Deregulation for SMEs
- Controlling public sector expenses
- Transferring more federal resources to states and municipalities

8.3 Incubators

Incubators in Mexico date from the workshop of Dr. Pierre Abetti (Rensselaer Polytechnic University, New York), and the feasibility study for the technology park in Cuernavaca by Mr. Rustam Lalkaka (UNDP, New York) in 1990. In 1991 NAFIN, the Mexican national development bank, organised a workshop on administrative skills for entrepreneurs, while Mr. Lalkaka (UNDP) conducted an interregional seminar on Creation and Strengthening of Technology-based Enterprises. The Mexican Incubator Association (AMIEPAT) was formed, holding its first meeting in February 1992 with a focus on training to initiate and manage the process of creating new technology-based companies.

No explicit national policy concerning incubators as a tool for economic development exists in Mexico. The National Council for Science and Technology (CONACYT) and NAFIN are committed to the creation and development of incubators associated with educational and research institutions as an effective means of technology transfer. The strategy to date has included:

Table 8-3: Current Programmes to Support SEs, by Function

Business Assistance Centres:	
	Description & Results
1. Technology Research Centres (CONACYT)	Since the 1970s, several science & technology centres have been established. Initially created to develop specified research areas, they began to address industry needs. All are now either privatized or closed.
2. SME support modules (CANACINTRA)	Industries collaborated to establish regional offices and information, training and consulting modules.
3. LANFI	Founded as a federally funded centre to develop specific innovations for industry. Recently divided into specialized units and sold to industry; transformed into centre to facilitate technology transfer from academic and research organizations to industry.
Training & Consulting:	
	Description & Results
4. Continuing Education Centres (university affiliation)	Continuing education and technology transfer centres affiliated with universities.
5. NAFIN	Franchises with access to information networks and materials developed by NAFIN. Includes strong training programme for SMEs at attractive prices.
6. DESEM	Entrepreneurial programme supported by industries. Enterprise workshops for students from elementary school through to university level.
Loan & Equity Funds:	
	Description & Results
7. NAFIN	Primary source for industrial development financing, offering credits to industry at concessionary rates. Collateral requirements and high interest rates (70-120% 1st Qtr '95) reduce SME participation.
8. CIMO	World Bank and Federal funds for consulting services for SMEs. Finances 70% of costs and features follow-up programmes.
9. CPMACUT	Credits to SMEs for innovation and technology development. Risk capital programme finances industry-academic joint ventures.
10. PRONASOL	Major tool of past presidential administrations for credit and non-refundable funds to SMEs—directed to poorer strata of society as well as infrastructure development.
11. BANCOMEX	Federal and international resources to support exports, including train-
ing	programmes for marketing and exporting.
Legal & Fiscal Regulations:	
	Description & Results
12. Integrating enterprise modalities	1993 initiative to encourage SMEs to develop joint ventures and gain economies of scale.

- Workshops and visits of consultants to foster the diffusion of the incubator concept (1992)
- Financing of feasibility studies—20 in 1993, 10 in 1994, 3 in 1995
- Creating the Technology-based Incubator Programme (PIEBT) to provide capital to equip incubators and to target assistance to companies

NAFIN moved from its earlier traditional role in financing large industrial projects to serve SMEs, working through primary level banks. NAFIN and CONACYT joined to create the first trust for the Ensenada incubators. Ten incubators are now in operation in Mexico since the beginnings of the programme in 1990. At least four (Ensenada, Cuernavaca, Querétaro, Yucatán) have been in operation for over two years. An additional three incubators are currently being implemented (Table 8-4).

Mexican incubators required a wide range of start-up capital, from US $164,000 to almost $1.2 million, with an average of US $822,000. New construction is a major start-up cost, with equipment costing considerably less. Business planning for incubators is either developed internally after start-up or as part of the initial feasibility study.

Table 8-4: Status of Business Incubators in Mexico

	Tech		Start-up Capital	Building Area, sq. metre			Tenant	
	Yr.	-based	US$(thousands)	Gross	Net	%	sq. metre	%
Ensenada - IEBT	90	X	468	2,500	1,380	55	818	33
Cuernavaca - CEMIT	90	X	164	600	300	50	224	37
Querétaro - PIEQ	94	X	388	200	120	60	120	60
Yucatán - IEBT	92		1,266	2,500	1,565	63	665	27
Guadalajara - UNITEC	92	X	1,174					
Itesm-Morelos	94		928	2,500	540	22	180	7
Unam - SIECYT	95	X						
La Paz - IEBTNOR	94		1,246					
Colima	94	X	815					
Toluca	94		249	200	150	75	150	75
In Process, buildings acquired								
Chihuahua		X						
Tamaulipas		X						
Anáhuac		X						

Staffing and Services

Staff sizes at Mexican incubators are modest. Middle-aged, male engineers predominantly make up the management of these incubators, with two facilities led by lawyers and one by a psychologist. A wide range of services is also provided by the incubators, with the costs bundled into the rental payment (Table 8-5).

Through both staff and consultants, a variety of professional business assistance is available through the incubator programme (Table 8-6). Some of these activities are bundled in with the rent charge.

Incubators are mainly concentrated around Mexico City (Figure 8-1).

Figure 8-1: Incubators in Mexico

The literature chronicling the best practices of incubators advocates a wide variety of programmes conducted by facilities on behalf of their tenants. Technical assistance from an associated university is generally listed as the most significant tenant/sponsor interaction. Notably, fostering networks with other businesses is not a characteristic of many programmes. The industrial profile of tenant activities varies widely by incubator, with a significant number of service industries. Most tenants are in the start-up and growth phases of business development (Table 8-7).

The low "discontinued business" figure above suggests an overall successful programme in business development. Given this assessment, the incubator programme appears to be delivering 2.6 successes per failure, as compared to a figure of 0.25 successes per failure outside the incubator system.

Table 8-5: Services Offered by Incubators in Mexico

	Ensenada	Cuernavaca	Querétaro	Yucatán	Colima	Guadalajara	Toluca
Secretarial Support	I	I	I	X	I	I	I
Phone Answering	I	I	I	I	I	I	I
Mailing				I	I		I
Word Processing	I	I	I	X	X	I	I
Printing	X	X	X	X	X	I	I
Plotting	X			X	X	X	
Fax	X	X	X	X	X	X	I
Photocopier	X	X	X	X	X	X	X
Document Binding	X	X	X	X	X	X	X
Computer Network		P	P	P	I	X	X
Internet Access	X	X	X	X	I	I	
Work Stations					I		
PC Support	X	X	X	X	I	X	I
Office Furniture	I	X	X	I		I	I
Parcel Service	I	X	X	X		I	I
Meeting Room	I	I	I	I	I	I	I
Conference Room	I	I	I	X	I	I	
Exhibition Facility	I	I	I	P	I	I	I
Library	X			P	I	X	
Video	I		I	I	I	X	I
Conferencing	X		I		X	X	
24-hour access	I	I	I	I	I	I	
Security	I	I	I	I		I	I
Access to University	X				X	X	
Laboratories	X				X	X	
Rental of Equipment	X	X	X		X	X	X
Common Workshop							
Storage Space		X	X			X	
Loading Facility		I	X			X	
Utilities:							
3-phase Power	I	I	X	X	I	I	
Industrial Air							
Water	I	I	X	I	I	I	I
Gas		X					I
Other:							X
Lunch							X

X - provided I - Included in Rent P - Planned

Table 8-6: Incubator Programmes for Business Assistance—Mexico

	Ensenada	Cuernavaca	Querétaro	Yucatán	Colima	Guadalajara	Toluca
Business Planning	X	X	X	P	P	X	X
Financial Management / Cash Flow	X	P	X	P	P	X	X
Marketing & Sales	X	X	X	P	P	X	X
International Trade	X	P	X	X	P	X	X
Bookkeeping		P		P		X	X
Legal Matters	X	X	X	P	P	X	X
Technical Counselling	X	X	X	P	P	X	X
Laboratory & Workshop	X				P	X	
Materials					P		
Business Advice, in-house	I	X	I	I	P	I	X
Employment	X				P	X	X
Training	X	X	X	X	P	X	X
After-Graduation Services	X	X	P	P	P	X	X
Finance:							
Gov't. Grants / Loans	X	X	X	P	X	X	X
Seed / Venture Capital		P	P	P	X	X	X
R&D Finance							X

X - provided I - Included in Rent P - Planned

Financing

Financing for both incubators and their clients is a critical issue in every situation. In Mexico, CONACYT took a strong role in providing financing for both incubators and their tenants (Table 8-8). Service income for incubators may be under reported, and rental income over reported, as the cost of many services is included in the space rental fee. Service income is obviously the major contribution to revenue at many incubators.

Organization

Beyond the seminal role of CONACYT, universities and research institutes are major sponsors of incubators in Mexico. All of these incubators have similar organisational structures, with CONACYT and local universities playing significant roles (Table 8-9). A majority of the incubators use the legal form of a trust, while only one incubator is private.

Goals, Objectives and Criteria for Success

Several agencies evaluate the incubation programmes, unfortunately without coordinated criteria. The inconsistency is most clearly evident in the expectations regarding the development of self-sufficiency. The goals of the

Table 8-7: Incubator Tenant Characteristics—Mexico

Industry	Ensenada	Cuernavaca	Querétaro	Yucatán	Total
Electronics	4	5	3		12
Telecommunications	1				1
Biotechnology		1		1	2
New Materials	2	1			3
Energy	1	4			5
Ecology	1	3	1	2	7
Services	5	1	6	2	14
Civil Engineering		2			2
Software	2	3	4	1	10
Computer Systems		2			2
Mechanical Engineering	2	4			6
Chemical Engineering	1				1
Nuclear Engineering		1			1
Food & Aquaculture	7	—	—	1	8
TOTAL	26	27	14	7	74

Stage of Development	Ensenada	Cuernavaca	Querétaro	Yucatán	Total
Idea Formulation		1			1
Business Plan	2				2
Start-up	5	5	7	5	22
Growth	15	13	7	2	37
Restructuring	3	1			4
Discontinued	1	5			6
Established	—	1	—	—	1
TOTAL	26	26	14	7	73

incubation programme overall, however, are explicit. They include:

- Fostering the entrepreneurial spirit in academic and research institutions, as well as in the community as a whole
- Creating new enterprises
- Creating jobs, particularly high value-added jobs
- Developing and implementing new tools for technology transfer
- Contributing to the gross product revenues of the incubated company
- Modelling new kinds of enterprises: ecological, sustainable, competitive, flexible, and strongly linked to significant networks

To reach these goals, process variables are monitored and evaluated to assess the activity of the incubator and its tenants, including:

Table 8-8: Financing for Incubators and their Clients

Incubator:	Objective	Major Contributors
Trust, usually formed by two or more institutions	Initial capital for pre-operational and initial operational stages	CONACYT, NAFIN, state government, universities & research institutes
Specific projects	Seed money for training programmes, promotional events, etc.	CONACYT, institution housing the incubator
Tenant:	**Objective**	**Major Contributors**
Formal Credit	Special interest rates	Bank makes arrangement with NAFIN funds. NAFIN and CONACYT trust fund (FIDETEC).
Seed Capital	Very few cases of private investors	CONACYT plans to implement through incubators
Training and Consulting	Non-returnable	CONACYT provides 50% of costs for these programmes. CIMO (Federal and World Bank funding) provides up to 70% of training and consulting costs of SMEs
International Marketing SME export programmes		Secretariat of External Affairs established in conjunction with Programa Bolivar and OEA.

- Number of tenants
- Self-sufficiency of both incubator and tenants
- Average number of years for graduation
- Income of tenant companies

The incubator programme's contribution to the links between academia and industry is assessed by the following measures:

- Technology transfer to new companies
- Number of researchers, students, or teachers involved in technology-business enterprises
- Numbers of patents and other means of capitalising technologies

Table 8-9: Incubator Organisational Structure—Mexico

Incubator	Board of Directors	Advisors
Ensenada	CONACYT, NAFIN, Cicese (Research unit)	
Cuernavaca	CONACYT, 3 Universities, Electrical Research Institute, State Government, 2 Industrial Associations	
Querétaro	CONACYT, 2 Universities, CONCYTEC (State S&T Council), State Government	Natural Resources Centre
Yucatán	CONACYT, State University, Centro de Desarrollo de Negocios Internacionales de Yucatán, International Business Development Centre	Universidad de Yucatán, Comite Tecnico
Guadalajara	CONACYT, Centro Queretano de Recursos Naturales	Asesor Enlace, Comision de Evaluacion
Itesm-Morelos	CONACYT, NAFIN, Itesm	
Unam	CONACYT, NAFIN, Unam (Centre for Innovation)	
La Paz	CONACYT, NAFIN Cibnor (CONACYT Research Centre), Banrural board representatives	Business Committee,
Colima	CONACYT, University Productivity Centre	
Toluca	Incubator Director	CONACYT, NAFIN, CANACINTRA, SECOFI

Given a general scarcity of resources, many incubators focus their attention on current tenants, losing track of the graduates that contribute jobs to the economy. Some incubators, however, have established follow-up programmes to maintain support and assess the employment impact of the incubation modality.

Entry and Exit

Standards for entry form the basis for operation of the incubation modality. A business plan for a proposed tenant in turn forms the basis for the entry process. Entrepreneurs are drawn to the incubator from both research centres and the private sector. Interestingly, relatively few entrepreneurs came from universities, in spite of significant technical linkages between the universities and the incubator tenants (Table 8-10).

Table 8-10: Origin of Entrepreneurs

Source of Entrepreneurs	Ensenada	Cuernavaca	Querétaro	Yucatán	Total
Research Centre	8	17	2		27
University	3		3	4	10
Private Sector	6	9	9	3	27
Public Sector	4				4
Other	8				8
TOTAL	29	26	14	7	76

Graduation policies from the incubator are the other critical process to be considered. A three-year tenancy appears to be the basis for graduation in the surveyed incubators, with the Yucatán facility posting a two year graduation policy (with no graduates to date), and Cuernavaca enacting a three to four year policy.

Operating Results

The incubators in the Mexican system have yet to achieve, or even approach, financial sustainability (Table 8-11).

Table 8-11: Incubator Operating Results in Mexico

	Cuernavaca		Toluca	Yucatán	
	1991	1994	1994	1993	1994
Tenants (year end)	5	9	4		5
Employees		96	16		30
Graduates	—	—	—	—	—
Operating Revenue:	41,087	162,978			
Rental Revenue	10,843	32,695			2,129
Service Revenue	3,738	15,792	3,400	2,046	1,064
Total Operating Revenue	55,668	211,465	3,400	2,046	3,193
Operating Expenses:					
Personnel	30,000	48,539	28,066	30,783	31,472
Consultants	22,248	28,858	12,028	325	670
Facility Rent	12,754	33,145	2,361		
Facility Maintenance	5,024	4,387			
Utilities	2,997	18,606	32,333	18,957	22,446
Depreciation	2,824	3,609			
Other	10,011	12,142			
Total Operating Expenses	86,726	168,451	74,388	50,064	54,588
Operating Surplus (Deficit)	(31,058)	(43,014)	(71,388)	(48,018)	(51,395)
Other Revenue					
Financial	248	289	68,570		11,385
Contributions of Capital	62,969				102,510

8.4 Conclusion

Up to the present, incubators have mainly been relegated to universities and research centres. State Government has been little involved in either understanding or using incubators as a tool for employment generation. From the experience of the first Mexican incubators, some Government officials became disenchanted with the small number of companies and jobs that emerged. Their disappointment, however, was based on unequal comparisons of the results from other strategies, such as creating temporary jobs in labour-intensive projects like road construction and maintenance.

The analysis of the number of companies developed by incubators, and their revenue capacity, reveals low

rates of growth. These results are similar to SMEs not involved in the incubation process. Incubators are compelled to cover missing linkages in the business support system—a large range of activities dealing with promotion, community relations, entrepreneurial training, and financing. The result is an overburdened incubator manager who has to attend to tenants and also promote incubation processes in several fora to attract high quality tenants to the incubator.

The first Mexican incubators were conceived following the models created by more industrialised countries—nations which can count on the availability of basic resources, such as information, financial support, investment in building construction/renovation, and the like. Significant effort was expended in negotiations with NAFIN, CONACYT, state governments, universities and others, to obtain the capital necessary for implementation of the incubation process. Several projects were abandoned when such resources were not forthcoming.

Now, efforts are being made to demonstrate that incubators can be financially self-sufficient in Mexico, since they currently need about a 50% subsidy in order to survive. At present, managerial energies are sapped by incubators trying to attain financial stability, thus taking away from longer term objectives, such as the creation of companies and associated value-added jobs. The incubation process in Mexico is searching for new models which offer greater flexibility and adaptability, both in terms of operational strategies and in the types of projects appropriate for incubation.

Two out of the ten incubators have had more success accessing loans from development banks to finance emerging companies. High interest rates represent a heavy burden for start-up companies. Most businesses start with family resources and begin by delivering services before they invest in launching commercial products. This process limits their growth, and potential future existence.

A general assessment of the development of incubators shows that addressing several key factors could transform them into more effective tools:

- There is a need for more involvement of state governments and existing companies in using incubators as tools for development, either of specific sectors or of supplier programmes.
- Start-up incubation projects should locate strong candidates for prospective incubator managers, and the community leaders that will act as sponsors and supportive champions of the project.
- The initial investment for building construction should be evaluated in the context of alternative uses of the funds. For instance, part of the same funding could be devoted to promotion, training, and seed capital funds. Overall, what level and type of support is most effective for emerging companies remains to be decided by each incubator.
- The requirement of financial self-sufficiency in the initial years of an incubator operation constitutes a heavy burden for the incubator manager. Such demands shift priorities from working directly with companies to involvement in other projects which represent a surer source of income for the incubator, but which detract from the facility's mission.
- More information on the evolution of companies is needed so that incubators may be evaluated on how they impact the creation of high value-added enterprises.
- The investment of institutional resources in incubators is very low in comparison to other programmes: 0.0059% of bank credit extended to SE's, 0.54% of the national budget in science and technology, and 3.23% of CONACYT's budget.

Incubators must mature as a modality to show clear success stories. Such success stories will provide the basis for institutions and Government agencies to fund incubators as a new way of creating better jobs for the people of Mexico.

8.5 Case Studies

Incubators illustrate a range of strengths and weaknesses in the process of the incubator modality being implemented and modified to meet local conditions and needs (Table 8-12).

Creation of Fideicomiso Parque Tecnologico Morelos (FPTM)

Morelos, one hour away from Mexico City, is a small state of 5,000 square kilometres (6.5% of Mexico's territory), with an estimated population of 1,200,000 inhabitants, one fourth of whom live in the city of Cuernavaca. Morelos is well-served by transportation and telecommunications. Tourism, mainly oriented toward local and national visitors, accounts for a large percentage of the services industry. Historically, Morelos was an agricultural state dominated by big plantations and weekend resort centres. After the 1910 revolution, it returned the ownership of land to communities. Sugar cane, rice, fruits, and flowers are the main agricultural outputs.

Industrialization began to flourish in the 1970s with the creation of CIVAC, Morelos's main industrial park, which houses 300 industries—a significant number devoted to chemical and pharmaceutical products, and a Nissan automobile plant. Within the past 20 years, several national research institutions were established in

Table 8-12: Selected Incubator Strengths and Weaknesses

Incubator	Strengths	Weaknesses
CEMIT Cuernavaca (Research-based)	Critical mass of technical business enterprises (TBEs) with an average age of five years, providing visibility to the process. Wide range of stages of TBE development, providing a basis either for broadening or specialising its operations. Commitment of several research institutions and CONACYT to develop additional tools to promote the creation of TBEs, including non-research managers and earlier stage activities. This transformation to earlier-stage involvement coincides with the name change to SEMIT (System of TBEs) and forms the basis for the creation of satellite incubators. Diminished Government commitment presents the opportunity for privatisation of the incubator.	Different interests of Technical Committee (representing various institutions) slowed decision-making process. TBEs perceived by the new state Government as just another type of business; commitment to sustain investment in CEMIT is not apparent.
CIDET Toluca (Consultant-based)	Management of regional studies provides information for the establishment of new enterprises. Organisational structure allows private as well as public involvement, offering the potential for greater operational flexibility through fewer committees. Stages of growth are designed to facilitate adequate financing for the planned functions.	Technological ties may be weak, potentially limiting the ability of the new firms to keep pace with technological developments.
PIEQ Querétaro (Government-based)	Strong commitment by state Government to establish an incubator within a broad strategy of regional industrial development. Sufficient resources obtained to establish adequate facilities.	Pressure for short-term results. Adequate financial support for individual TBEs yet to be established.

Morelos. Today, Cuernavaca, the state capital, has 28 academic and research institutions with more than 1,500 researchers, ranking it second only to Mexico City in the numbers of researchers per capita.

The most prestigious research centres are the Electrical Research Institute (IIE), the Mexican Water Technology Institute (IMTA), the National Health Institute (INS), as well as research units of the National University established in Cuernavaca, with specialties in biotechnology and solar energy systems. The core industries in the state include: electrical energy and conservation, biotechnology, water supply and distribution systems, health sciences, electronics, computer hardware and software, and ecological services. Technical services, such as laboratories, information centres, and a highly-trained human resource base, provide favourable conditions for the emergence of technology-based enterprises (TBEs).

The Electrical Research Institute (IIE), at the behest of its director, Guillermo Fernandez de la Garza, explored the concept of transferring technology to industry by creating new enterprises in alliance with major companies. Although this approach worked for only six or seven TBEs, it began to create a new professional option, whereby a researcher could also view himself/herself as a potential entrepreneur. As a result, individual researchers began to establish their own companies. Today, IIE employs 600 researchers, with a third of that number working for 43 TBEs managed by former employees.

Researchers, academics, and trained specialists from other organisations began to form their own companies, creating 70 TBEs, of which three closed and 54 still remain in Morelos. In order to manage and accelerate this process of technology-based SE development, five organizations created a fund known as the Morelos Technology Park Trust (FPTM) in 1988. The founders were: the Government of the State of Morelos, the Electrical Research Institute (IIE), the National University of Mexico (UNAM), the Morelos Industrial Association (ADIEM) and FIDEIN (a special fund of NAFIN, created to foster the establishment and the development of industrial parks). In 1990, FIDEIN disappeared as a NAFIN programme, forcing NAFIN to leave the trust. In the following years, four more organisations joined FPTM: the National Polytechnic Institute (IPN), the Chamber of Manufacturing Industries (CANACINTRA), Morelos University (UAEM), and the National Council for Science and Technology (CONACYT).

With the technical assistance of Mr. Rustam Lalkaka from UNDP, a feasibility study undertaken in 1989 proposed a strategy comprising: creation of incubators, development of entrepreneurial training programmes in academic research organisations, attraction of seed and venture capital as well as other financial sources, development of a technology park, and organisation of a centre that would undertake techno-economic studies in visualising new market opportunities.

FPTM initiated its activities with US $50,000, focusing its first efforts in finding land for a technology park. In January 1994, the trust received from the Government 6.2 hectares to establish the park. Meanwhile, FPTM began to organize the Centre of Innovative Enterprises (CEMIT) incubator, which opened its doors in a 600 sq. metre rented space in November 1990.

FPTM has received significant assets from its eight members to date, including US$ 200,000 in capital funds and contributions in kind of US$ 285,000 from IIE.

The Technical Committee of FPTM is investigating to what extent the process of creating TBEs can be self-sufficient in Mexico. Additional concerns include the need to develop mechanisms to strengthen linkages between R&D and economic activity prior to the emergence of new companies. The initial expectations of the founding members of FPTM were:

- To develop mechanisms that foster the utilisation of scientific and technological capabilities by creating new, high, value-added jobs;

- To positively impact the GDP of Morelos;
- To establish a state-of-the-art facility, decentralizing industrial activity, and fostering non-polluting and highly competitive new companies;
- To promote entrepreneurial culture in the region.

To meet these expectations, FPTM will develop:

- A technology park with the necessary facilities, networks and services to offer a high quality environment;
- Incubation processes by means of its own incubator and by fostering the creation of more within the state;
- Networks between TBEs, R&D organizations and local, national and international markets and distribution channels.

Results

FPTM results from 1988-1994 are listed below:

Incubation processes:

- FTPM established CEMIT in 1990 which, up to the present, has facilitated the initial growth and maturation of 38% of the TBEs created in Morelos. Through CEMIT, FTPM has also offered promotional services to the rest of the TBEs.
- Through the activities of CEMIT and the Mexican Association of Incubators and Technology Parks (AMIEPAT), some institutions (University of Morelos, Zacatepec Technological Institute) started entrepreneurial programmes. Monterey-Tech at Morelos recently started its own incubator.

Seed and venture capital:

- FPTM is a pioneer in promoting the creation of special funds to support TBEs and incubators among national financial agencies like NAFIN and CONACYT. The programme established by CONACYT to support incubators is a good example of commitment by a public agency to the incubation process. NAFIN's support of several incubators was also significant, even though this institution's contribution is more difficult to assess.
- Resources offered to TBEs by CIMO (a programme created by the Federal Government and the World Bank to support training and consulting activities) have been very useful to entrepreneurs.

Entrepreneurial training programmes:

- In terms of entrepreneurial programmes, CEMIT established an annual 90 hour workshop that served as the major source of new tenants for the incubator.
- As a result of FPTM initiatives, The University of Morelos and Monterey-Tech at Morelos developed their own training programmes.
- CEMIT worked with Zacatepec Technological Institute to establish a curriculum oriented toward developing entrepreneurs.

Development of Morelos Technology Park (PTM):

- FPTM studied ten alternative locations for the establishment of the Morelos Technology Park, deciding on a

6.2 hectare piece of land, outside of the university campus, to preserve autonomy for PTM and facilitate adequate property investment conditions for the business community. The size of the lot provides an appropriate location for the first stage of development of a technology park.

FPTM developed a master plan for the initial construction, under review by the state Government, since the project relies heavily on its support.

Twenty-four companies, requesting a total of 10,300 sq. metre, expressed interest in moving into the park.

According to a follow-up conducted by CEMIT and UNAM, of the 70 TBEs created in Morelos in the past eight years, three closed. The 47 companies surveyed created 264 full-time and 38 part-time jobs. Thirty of these firms have personnel with post-graduate degrees. These TBEs hold 14 patents and intellectual property rights to 20 software products. A significant number of these companies are oriented toward technological services—a function of the presence of large public research institutions in the area, such as the Electrical Research Institute (IIE) and the Mexican Water Technology Institute (IMTA).

Such service companies enjoy the advantages of needing fewer initial financial resources, the ability to grow easily for a specific project because of their ability to contact specialised personnel (former colleagues), and the capacity to easily decrease in size when projects come to an end. They also tend to enter into the product area after their third or fourth year, when they develop a special type of service that can be packaged and sold.

Conversely, problems associated with such "bootstrap" entrepreneurs include: modest potential growth, unpreparedness for international markets, and fewer opportunities for major projects requiring extensive financial resources. The technological innovation advantage of such firms is often tenuous, in comparison to larger firms that can spend significant amounts of money for ongoing research.

Centre for Innovative Enterprises, Cuernavaca, Morelos (CEMIT)

CEMIT operates in a 600 sq. metre rented space, located in the middle of CIVAC, the industrial district of Cuernavaca. CEMIT was inaugurated in November 1990, receiving its first tenants in April 1991. From its creation in March 1992, CEMIT was managed by Enrique Moreno, an entrepreneur in the field of electronics, who worked very closely with the first tenants and introduced them to the industrial community. Its second manager is Lilia Arechavala, a specialist in management education and former researcher at IIE. A group of consultants joined the incubator in 1993, providing tenants and outside firms with more interdisciplinary services. (Figure 8-2)

Some benefits TBEs mention having derived from CEMIT include the following: (Table 8-13)

- Business contacts, and synergy with other tenants and outside companies at promotional events
- Innovative policies concerning the relationships between TBEs and public institutions
- Successful restructuring of companies undergoing technological and managerial changes
- Community awareness of an emerging knowledge-based industry
- Quality training and consulting programmes

Areas where CEMIT has not been able to create enough value:

- Because the space is rented from a private landlord, CEMIT is not able to offer attractive rents to tenants. Negotiations with the landlord to offer space and office services directly to tenants, not necessarily TBEs, will allow CEMIT to focus on promotions, training, and other supporting activities. If these negotiations are successful, CEMIT will become a "virtual incubator".
- The lack of financing limits the growth rate of companies. The potential of developing a consortium of companies to access larger projects has not been fulfilled.

Figure 8-2: CEMIT Organizational Chart

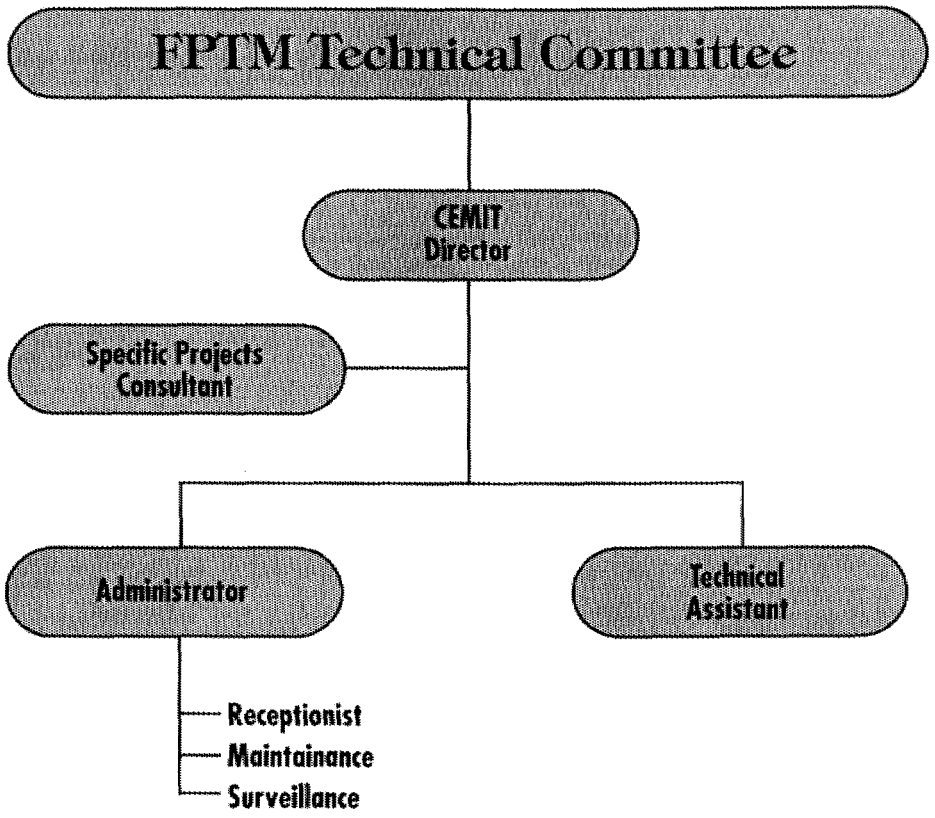


Table 8-13: CEMIT Services to Promote the Creation of TBEs and to Strengthen Linkages

Project	1990	1991	1992	1993	1994	Total
Institutional Promotional Projects				5	4	9
Entrepreneurial Training Programmes	1	1		1	1	4
Promotion Events for TBEs			7	19	9	35
Promotion Events for Incubator		1	2	13	8	24
Participation in Promotional Events of AMIEPAT	1	6	4			11
National & International Visits to CEMIT	—	—	—	10	1	11
TOTAL	2	8	13	43	19	94

- The current economic environment inhibits new firm creation by technical researchers. Emphasis is shifting toward attracting unemployed professionals to work with researchers in actively developing new TBEs.
- CEMIT has operated with scarce resources since its creation. Even so, it contributes not only to the activities directly related to its mission, but also as a support group for the Technology Park Programme. Since CEMIT is understaffed, the incubation process has received less time and attention than it deserves.

A summary of financial results of CEMIT through its five years of operation shows a significant operating loss (Table 8-14). Through fees charged for its four basic classes of service, CEMIT is expected at this writing to post a positive operating balance at the close of fiscal year 1995.

Table 8-14: CEMIT Financial Results

Operating revenues and expenses (five years of operation)

	US $
Operating Revenues	$539,739
Operating Expenses	553,187
Net Operating Income (Loss)	($13,448)
Feasibility study	8,696
Renovation (net)	$16,944
Equipment (net)	17,691
Operating Subsidy	50,828
TOTAL	$94,159

Services income and costs

	Rent	Office Services	Consulting Services	Training Programmes	Other	Total
Services Income	8,504	$12,675	$17,184	$48,726		$87,089
Expenses	9,313	9,313	29,772	9,007	76,402	124,495
Net Margin	($809)	($12,675)	($ 12,588)	$39,719	($76,402)	($37,406)

The incubation process at FPTM/CEMIT is evolving from a model project into a more structured network. As it does so, it should enact the following:

- Separate the rent and the office services business from supporting the creation of TBEs, in order to develop a flexible financial and operational strategy.
- Increase networking activities at earlier stages of incubation through involvement in the institution's internal programmes. Working with the researcher while the innovation is being developed provides the ability to orient the project to industrial markets.
- Separate the incubation and TBE strengthening activities from the Technology Park project to clarify

specific financial and operational commitments and financing.

- Develop new means of helping TBEs penetrate industrial markets—such as diagnostic projects for specific sectors—in addition to the general (and often sporadic) support from formal industrial associations.
- Attract highly-skilled, unemployed professionals to take leadership roles in developing TBEs from the intellectual output of researchers and academics.

Some of the strengths of the Morelos TBEs are:

- Well-developed network of innovator-consultants
- Highly-skilled and adaptable workforce
- Concentration of technology-intensive enterprises
- Efficient system of information and technology transfer

These strengths are offset by the following handicaps, which make TBEs vulnerable:

- Inadequate capital investment
- Unavailability of working capital in appropriate sums or on feasible terms
- Inability to develop subcontracting with larger companies and supplier arrangements to public agencies
- Inability to develop profitable export capabilities

Mexico lacks a well-developed culture of entrepreneurship, and time is required for budding business owners to grasp the importance of developing strong managerial qualities—emerging entrepreneurs all too often modify their attitudes only in response to crises. External conditions that would foster the maturation of companies, but that are lacking in Cuernavaca, include: effective venture capital networks, dependable and structured subcontracting of private and public R&D expenditures, and better business support services.

Centre for Innovation and Technology Development from the State of Mexico (CIDET), Toluca

The State of Mexico surrounds Mexico City to the east, north, and west. It is a densely populated area with 224 technical schools and 139 centres offering degrees at the bachelors' and postgraduate levels. Industrial activity accounts for 18.2% of the national output, with a substantial percentage of this being in the automotive sector. On the other hand, nearly 90% of the existing economic units are small to medium-sized companies, employing 85% of the economically active population. Businesses have a high mortality rate, with three closures registered for every new company created.

The corridor connecting Toluca, the state capital, and Mexico City, provides sound transportation and communications infrastructure to the area. The industrial base here is the second largest in the country. Growth began in the post-war era, with consolidation of manufacturing in the 1970s, and continued expansion thereafter. This growth can be partially attributed to the importance that successive state Governments gave to the development of industrial parks beginning in the 1940s. Currently, 31 industrial parks (24% of the 130 developed in Mexico) house 1,353 companies, mainly in the chemical, manufacturing, textile, and food processing/service sectors.

While industrial activity is 40% of the state GDP, local economic impact is minimised since corporate offices are usually located in Mexico City. Industrial development has been furthered by the following: advantageous fiscal structures, efficient exploitation of natural resources, sizeable domestic markets, and a semi-skilled human resource base. Economic policy discussions are split on the relative importance of attracting more big industries, as opposed to developing small and medium-sized enterprises.

CIDET is a project that originated within the state university between 1991 and 1992, with the support of CONACYT and the state government. CIDET was based on the creation of a trust that planned to transform an existing building into an incubator. Faced with turnovers in state and university authorities, the formation of the

trust was not consummated. A new model of incubation was conceived to encompass the creation of new companies and to strengthen existing microindustries in the region. Operations commenced in May 1993 with six companies participating. CIDET is a private corporation training entrepreneurs, supporting tenant companies, and creating innovation projects by focusing on the strategic industrial development programmes of the state (Table 8-15).

CIDET works primarily with and through CONACYT, CANACINTRA and NAFIN (as a co-investment

Table 8-15: CIDET Corporate Structure

CIDET Divisions	Corporate structure
CIDET - IEBT	Incubation system which offers space, administrative services, consulting, financing and promotional support to new companies or projects under development.
GRUPO CIDET, S.A.	Consulting unit, which designs and coordinates innovation programmes for public or private entities as well as TBEs. It has three full-time employees and can integrate associate consultants for specific projects in the areas of regional development, technology development in education, communication, health, law, and public administration.
CIDET-CSD, S.A.	Corporation of firms established in the incubator that functions as a marketing unit promoting integrative projects in the areas of automotive, manufacturing and agri-industrial technologies. Its main products and services relate to integrating electric cars, pollution control, and agri-industrial equipment.
CIDET-CINAD	Business planning and training unit that works on innovation projects for new and existing micro-industries, with the support of CIMO, the federal fund that finances training and consulting projects.
CIDETECH	Information and innovation system which specialises in gathering and analysing information to support development of innovation projects.
CIDET NIALE	International Business Centre for the analysis of information related to new opportunities in the national and international markets and to help in the establishment of alliances.
CIDET TRUST	Financial unit to establish a trust to offer investment funds and guarantees for TBEs. CIDET will take an active role as investor for a specific project.

with the European Firms Area of the institution). CIDET's present operations involve a number of companies and activities (Table 8-16).

The CIDET operations are undertaken by a pool of consultants. To date, CIDET has developed relationships with some 29 consultants, three of which are on a permanent, ongoing basis. Promotion forms an important part of the programme and between April 1994 and May 1995, CIDET developed a significant promotional presence, with some 268 publications and major participation in national and international events.

CIDET achieved operating break-even, deriving significant income from conducting studies and other

Table 8-16: CIDET's Present Operations

Companies		
TBE in incubation	Tenants	6
	Outside Companies	15
Present Status	New Creation	4
	Graduation	6
	In Operation	9
	Discontinued	2
	Total Companies	21
Entrepreneurs		
	Receiving Services	9
	Discontinued Projects	2
	Total Entrepreneurs	11
Projects		
	Technological Projects	12
	Socio-Technical Projects	24
	Total Projects	36

Table 8-17: CIDET Financial Situation, May 1994 - April 1995

	Tenants	Outside Sources	Total
Revenues			
Consulting Projects		3	$ 8,000
Studies		5	331,178
Evaluations		1	2,899
Credit			*135,743*
Services to Tenants	10		21,495
Other	1	2	2,241
Total Operating Revenue	11	11	$523,586
Operating Expenses			
Salaries			$156,003
Consultants			103,171
Promotion			97,135
Rent			21,904
Administration			59,661
Taxes			20,780
Total Operating Expenses			$458,654
Gross Operating Margin			$ 64,932
Financial Costs			7,424
Net Operating Margin			$ 57,508
Equipment			$106,980
Net Cash			($49,472)

externally-focused services (Table 8-18).

CIDET represents a second generation of incubators in Mexico, establishing new forms of financial support for tenant businesses. The delays encountered in forming a trust turned out to be an opportunity for CIDET to explore a new model based on the expertise and networking capacities of a group of consultants, with the idea of building a private innovation system for the region. Within this framework, the stages of incubator development are as follows:

First year	Development of regional, sectoral and innovation consulting projects
Second year	Integration of a production unit formed through an alliance of the TBEs established in the incubator
Third year	Diversification

Revenues from consulting projects formed the seed capital that started the tenant incubation process with six companies that otherwise would not have been able to pay for expenses. The process started as a virtual incubator and will develop into a mixed system with services for inside and outside tenants.

From the standpoint of the contribution of CIDET to the regional economy, there is strength in the programme since it concentrates on the first stage in creating the information and strategy required by a specific sector. In so doing, it provides a consistent market for the companies that emerge through the incubation process. By creating several entities to manage the process, CIDET has developed alternative strategies to deal with the ownership of the incubator (there are three main partners who own stock in the consulting firm, and who participate as investors in the company) while a new entity was created to administer public funds coming from national and international sources.

9 NIGERIA

9.1 Overview

Incubation as a development modality can only be effective in the context of a stable political and social environment. Nigeria is one country where an incubator system was developed with public funding as a quasi-independent entity. The unstable political situation in the country, however, resulted in a complete nationalization of the Nigerian incubator system in April of 1995. This chapter study looks at the Nigerian system before the nationalization, providing some insights into the pitfalls suffered by incubators in a constantly shifting context of public policy and support.

The first incubator in Lagos, prior to nationalization, was about 50% functional with a rentable space of 3,561 sq. metres demarcated into 22 units, and with 11 operating tenants. The second incubator, at Kano, was housed in temporary buildings. The rentable space of 300 sq. metres in 12 units was occupied by two operating tenants. The third incubator, planned for the city of Aba, was still largely on the drawing board prior to nationalization, although the site was selected, a manager appointed, and future plans made. Rapid development in the Nigerian incubators was hampered by inconsistent funding, structural problems in organizational relationships, and poorly construed linkages with relevant institutions.

Small enterprise schemes for economic development in Nigeria often suffer from similiar problems of implementation:

- Financing and loan schemes are usually difficult to access and face problems with delivery, technical assis tance components, and realistic repayment schedules;
- Training programmes are not fully linked with financing and other technical services;
- SME development centres are not properly funded;
- Numerous industrial estates for SE schemes remain half completed and lack extension services.

Linkages between agricultural and industrial development efforts directly enhanced Nigerian incubator creation. These linkages helped integrate consumption of available raw materials with the processing capabilities of local technology. One third of the enterprises in the Lagos incubator were involved with agri-business.

Governments committed to developing incubators need to study strategies for private sector initiatives and participation in the development of these facilities. In the case of Nigeria, cooperation between the domestic economic community and non-Nigerian industries could better facilitate:

- Transfer of technology and an enhanced understanding of the role of incubators in R&D;
- Opportunities for building capital investment from the international community;
- Exchange of knowledge between nations on the incubators' development.

For this study, primary data was collected from: selected foreign embassies; the World Bank; Government SME support schemes; international agency SME support schemes; management of industrial estates; and managers of the Lagos, Kano, and Aba Technology Business Centres.

9.2 Small Enterprise Support

Agencies and programmes established to support SME development in the mid-1970s grew to prominence in the late 1980s and early 1990s. A list of these and the kind of support they provided is in Table 9-1.

Table 9-1: SME Support—Nigeria

Agency or Programme	Support Provided
Nigerian Economic Reconstruction Fund	Financing
State loan schemes	Financing
Small-scale industry loans	Financing
Apex Unit, Central Bank of Nigeria and World Bank	Financing
Economic reconstruction funds	Financing
Small industries development loans	Financing
Entrepreneurial development programmes	Training
Working for Yourself (WFY)	Training
Industrial Development Centres (IDCs)	Training
ILO/NDE Programme	Training
Raw Material Research and Development Council (RMRDC)	Information
Private sector initiatives	Training

The record indicates a relatively unstructured approach to SME support in Nigeria until the late 1980s, when several programmes began to be implemented in a more organized fashion. These programmes have been characterized as tackling a relatively broad agenda with limited funding. Designing links between planning and funding in order to create synergy between programmes has proven particularly difficult.

On the whole, banks have been unwilling to lend to SMEs. A variety of reasons have been given for this, including: poor risk-sharing policies by banks; non-utilization of technical components for the loans; perception of SME lending as risky, difficult to supervise, and vulnerable to fluctuating market conditions; the expense required in staff training and development; inadequate bank liquidity; poor bank network development; and overall under-capitalization of SMEs.

The Nigerian Government offers tax incentives for investment. However, with a minimum investment of US $9,000 to qualify for such incentives, and US $170,000 to reach the maximum level of tax relief, small enterprises are disadvantaged by this policy. If the investment limits are not a daunting enough hurdle, the requisite mounds of paperwork and administrative procedures often exceed the capabilities of many small enterprises. Other schemes for tax relief, from accelerated depreciation, to reduced duties on foreign machinery and equipment, are applicable and useful primarily to larger enterprises.

Industrial estates, sometimes coupled with incubators, have been a major instrument of both state and federal Government for industrial development in Nigeria. While each industrial estate has its unique character, there are several common features among them:

- Real estate: built from large undeveloped areas of land, most industrial estates range from 500 to 1,500

hectares, with an average parcel within the estate comprising 1/8 hectare. The Lagos incubator has parcels of 100 sq. metres.

- Infrastructure: the infrastructure in estates varies from access only by a single dirt road, to a full menu of commercial utilities. Availability of these services varies among estates in the interior as well as within Lagos itself (Yaba, Matori, Ikeja, and Apapa).
- Ownership/sponsorship: except for the facility located on an old family estate, all industrial estates are publicly owned.
- Management/administration: the Ministry of Commerce and Industry, the Ministry of Lands and Housing, and the State Property Investment Corporation all manage various aspects of industrial estates, including rights to land (allocation and revocation, tenancy).
- Rental Rate: rental of a fully-built "industrial shed" varies from ₦35 to ₦44 per sq. metre per year, significantly higher than the incubator rental rate of ₦10 per sq. metre.

Plans to build additional industrial estates in each state have been constrained by poor implementation. With local Government and community support however, the estates developed at the state level were more effective than those developed by the Federal Government.

Loan schemes constitute another means of support for SMEs. Generally speaking, however, these operate in ways that frequently exclude the participation of local entrepreneurs. Problems with loan schemes include the following:

- Equipment and working capital loans are usually necessary for SMEs. Entrepreneurs report difficulty in synchronizing their business development plans with lenders' requirements.
- Minimum equity requirements are onerous for many SMEs.
- Cumbersome administrative procedures, confusing documentation and long delays create inefficiency and often a climate for bribery as the only means of access to current loan schemes.
- Technical support services are not available to complement available loans.
- High interest rates and fluctuating foreign exchange rates increase the burden of repayment for SMEs.

9.3 Incubator Programme

The Nigerian socio-political and economic context sets the framework for the effectiveness (or ineffectiveness) of incubators as economic development tools. Operative factors in the local context include the following:

1. Community interest in economic development is high but often remains unenacted except for the donation of land. Urgently required is the mobilization of local financial resources and development of an SME support network.
2. Access to loan programmes, as well as to locations in industrial estates, is not always provided on an equitable basis.
3. Entrepreneurial spirit is strong, but unmatched by supporting resources.
4. A network of expertise, technology and skilled workers is present in Lagos and Aba, but lacking in Kano and problematic in other areas.
5. Local capital is available but under-mobilized.
6. Domestic markets are undeveloped and unmatched by entrepreneurial production.
7. Development plans are in place that would support SME development, but they are hampered by ineffective implementation, integration and monitoring.

The obvious negative characteristics of economic development policies in Nigeria are a perceived lack of programme integration, the punitive nature of policy and financing terms, and a lack of effective monitoring of programme implementation. Corruption remains a serious problem as well with the Federal Government's "War Against Corruption and Indiscipline" (WAI-C) as evidence of its extent. Prior to nationalization, incubators were under a cloud of suspicion, due to allegations of corruption.

The Incubator Concept in Nigeria

Efforts to establish incubators in Nigeria began with a UNFSTD attempt to establish a pilot centre in Lagos State in 1989. After several years of little or no action following this original effort, incubators were eventually established under an umbrella organization, created to foster their development. The Nigerian Incubator System (TBI) Foundation was established in 1993, together with a national committee to implement the project set by the Foundation. Each incubator had a governing council to oversee operations. The Foundation Board and national implementation committee included representatives from the private sector as well as from the Federal and State Governments, with the chief executive acting as National Executive Secretary to the Board. Following the incubator seizure by the Government in April 1995, the above cooperative arrangements were effectively suspended. While incubators continue to operate locally in limited ways, their authority and fate at the national level remains an open question.

When it was operational, the national incubator programme had three major objectives:

1. Job creation, targeting unemployed university graduates, retrenched public sector employees, retired research institute employees, retired private sector employees, and established industrialists desiring to expand or diversify;
2. Commercialization of research results;
3. Promotion of SME development.

The Foundation, in turn, established the following specific guidelines:

- Provide spaces for tenant workshops and offices on a leasehold basis;
- Provide a comprehensive range of facilities and services to tenants, including business planning and enterprise counselling;
- Provide assistance in product development, research, and marketing;
- Link tenants with opportunities for training to enhance the practice of basic business skills;
- Create innovative new business start-ups and assist other enterprises in becoming tenants while maximizing their growth potential;
- Operate in a professional manner, with the goal of financial self-sufficiency within a reasonable time;
- Win recognition as a centre of excellence by providing high quality enterprise support services on an outreach basis to nearby firms;
- Borrow money, as well as receive grants to accomplish programme objectives.

The Foundation reported on the fiscal health of incubators in 1995, indicating operating deficits in the running of the incubator system (Table 9-2). The stated commitment of the Federal Government to incubator development was never matched by concomitant funding. Where State Governments provided substantial financial support, incubator development was much quicker.

Table 9-2: Budget for National Technology Business Incubator Foundation, US $

	1993	1994
Operating Revenue:		
Rental Revenue	US$ 3,013	US$ 3,442
Interest Income	2,872	5,233
Other	1,364	--
Total Operating Revenue	$ 7,248	$ 8,675
Operating Expenses:		
Administration	38,320	101,511
Facility Rent	682	
Utilities		
Depreciation	10,014	15,804
Other	6,420	35,313
Total Operating Expenses	55,436	152,628
Operating Surplus (Deficit)	($48,188)	($143,953)
Other Revenue		
Government Subvention and Rent	55,545	$ 228,236
Capital Equipment	--	158,690
Net	$ 7,357	($74,407)

When the Nigerian incubator system returns to full operation, a potential niche for its services lies in the mobilization of seed capital, together with support for small entrepreneurs in accessing existing programmes and training. Loan schemes are a primary means of small enterprise development, followed closely by training programmes. The individual entrepreneur often is unaware of, or fails to qualify for, various schemes due to a lack of programme integration, both in design and operation. Incubators would be a natural catalyst, and home, for a programme of matching SEs with seed capital.

Operating Characteristics

Incubators can be classified by economic development goals, source of funding, size and location, or a combination of these criteria. Nigerian incubators addressed the need to commercialize R&D results and to create jobs. The majority of entrepreneurs in these facilities were retired private sector workers and unemployed university graduates—on average 38 years old. Accumulated skills and education made training these entrepreneurs easier, particularly in Lagos. Unfortunately, conflicts between the various actors in management reduced the effectiveness of the incubator modality.

Nigeria is uniquely characterized by a strong entrepreneurial spirit, a high level of community interest, and a high level of corruption that the Government has taken measures to reverse. No clear policy guidelines have been made for SME development per se, much less for incubator development.

Policy-making, implementation, and monitoring for Nigerian incubators was predominantly in the hands of top Government functionaries. The private sector, in this instance, did not demonstrate a commensurate , commitment and willingness to assume the responsibilities of being a key actor in the new policy environment of

liberal economic reforms. As a result, designing a strong promotional effort to encourage greater private sector participation in SME and incubator development, is important if incubator programmes are to be re-launched in Nigeria.

Government funding of part of the incubator operations seems to have been important initially, given the economic circumstances of Nigerian communities. The goal of Government would then be to make the private sector and local communities carry the longer-term financial responsibilities for incubator development. If neither a Nigerian community nor the private sector demonstrates real enthusiasm and investment in an incubator, no amount of funding pumped in by Government will enable incubators to achieve the goal of self-sufficiency.

Because Nigerian incubators were relatively young prior to nationalization, only indicators that measure development towards selected targets are appropriate, e.g. degree of self-sufficiency or economies of scale. Considering such criteria, the Lagos incubator could be said to have achieved about a 30% performance rate. The Kano incubator operated at about 5%-10% effectiveness.

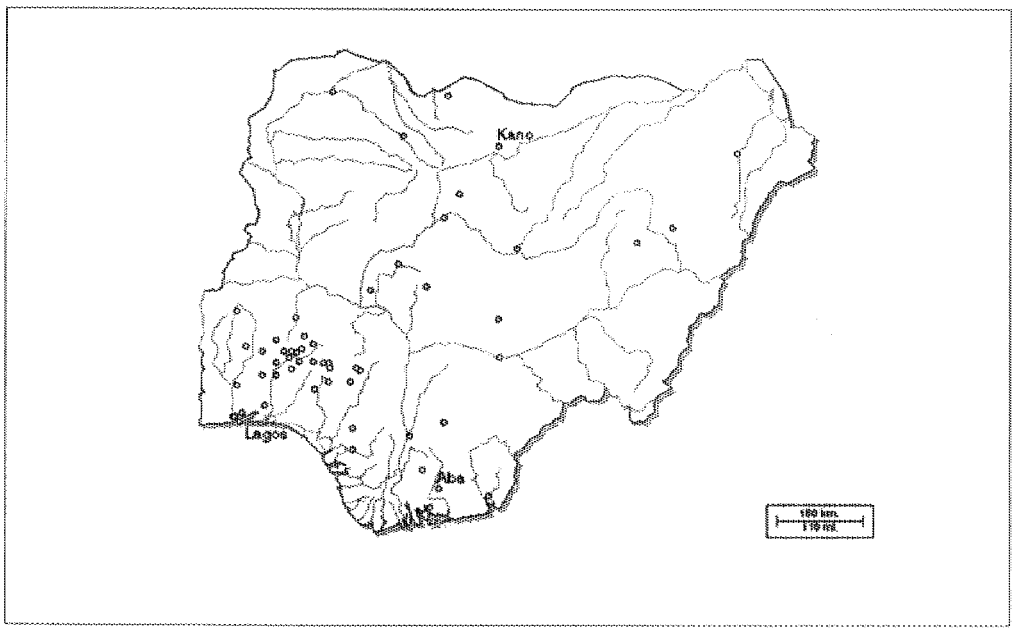
Funding and Future Development

About 95% of capital and recurrent funding for Nigeria's incubators was from Federal and State Government . This situation must be remedied if incubators are to play a sustained role in Nigerian national development. The UN Fund for Science and Technology for Development (UNFSTD) provided funding for feasibility studies regarding expansion. International involvement was recommended in creating a seed capital programme. No further action has been taken from this study since the nationalization. The ideal environment for incubator growth would be one in which sponsors and management focus local and national resources for system-wide development, while exploring possible linkages among various sectors of the economy.

Status of Business Incubators Prior to April 1995

Three incubators were in existence at different levels of development in the cities of Lagos, Nara and Ada (Figure 9-1).

Figure 9-1: Incubators in Nigeria



Both the Lagos and Kano Technology Incubator Centres (TICs) established administrative and secretarial offices, providing typing services (Lagos and Kano), photocopying (Lagos), and a conference hall (Lagos). Aba acquired some office equipment, which is presently warehoused. In the area of tenant services, the Foundation attempted unsuccessfully to set up an independent seed capital programme, despite potential foreign assistance from UNDP and the European Union. The Foundation's executive director had, however, initiated an inquiry into commercializable research findings from R&D institutions in Nigeria, defining the limits of the research commercialization mission.

After initiation of the national programme in 1993, the first national training seminar for tenants and managers was conducted in February 1995. An overall assessment of incubator operations taken at the seminar revealed positively that the Lagos facility had constructed a good network of roads. Conversely, however:

- No in-plant visits were made
- No organized technological development programme was mounted
- Tenants had not been linked to market opportunities
- No organized legal service existed for the tenants

The entrepreneurs targeted for tenancy in incubators included those groups with the presumed greatest need—unemployed university graduates and laid-off professionals. Only the Lagos TIC was in existence long enough to attempt a profile of the tenant population. In this incubator, the 11 tenants comprised eight private sector employees, one each university and graduate, retired public servant and former research institute employee.

The experience of the Lagos TIC would seem to indicate that the targeted groups were only marginally represented within the incubator. This suggests, perhaps, that the development of successful small entrepreneurs is not necessarily the same thing as servicing those individuals with the greatest economic need. The "pull" factors that attracted entrepreneurs to the incubator include: a clear desire for self employment, identification of an unmet market need, opportunity to develop a new product, and accumulated skill and technological expertise. Conversely, the "push" factors are: uncertainty about job security during a period of economic reform, and little satisfaction with employment in large enterprises.

The pool of entrepreneur-applicants varied by centre due to regional differences in business concentrations and promotional activities by the facility. In Lagos, five qualified applicants were rejected for every applicant selected for tenancy. While Aba reported a very large number of applicants, Kano did not receive sufficient qualified applications to hold a single interview and screening session. The overall impact of Nigerian incubators was small, due to the limited number of clients actually reached.

The recommendations in the UFSTD feasibility study regarding Nigerian incubator expansion were only partially implemented, and the counterpart funding from the Federal Government was not fully committed. As a result, the US $200,000 seed capital that was to be mobilized by UNFSTD from the European Union was not secured.

9.4 Conclusion

Nigeria used basically three tools of economic development to support the growth of the SME sector: loans, industrial estates, and entrepreneurship training programmes. The effectiveness of these tools was diminished by problems in: utilization of technical components (such as loans), implementation of industrial estates' development plans, and project monitoring. The Federal Government, having seized control of the incubators in Nigeria, is faced with several major challenges, not the least of which lies in attracting new investments from the private sector in the wake of nationalization.

Incubation programmes have the potential to contribute to economic development, but not without concomitant risks. The most significant factor contraindicating success in many African nations is poor implementation and monitoring by the sponsor—usually the Government. This management problem can frequently be attributed to the rapid turnover of Government desk officers, as well as to the administrative instability accompanying the rationalization of Government ministries.

A properly established incubation programme has the potential to provide the necessary continuous monitoring, market research, and assistance in enterprise diversification. Were an incubator programme to reduce undercapitalization, offset managerial inexperience, improve business planning, and focus community (including Government) resources, then it would have a significant impact on reducing the failure rate of businesses, and accelerating the overall growth of SMEs. The resulting acceleration in growth would be a major attraction for private sector investment from outside the incubator—an attraction that could be sufficient to drive private incubator development and investment in incubator tenants.

At present, doubts exist concerning the impact of a renewed incubator program in Nigeria, due to the experience prior to nationalization. Should the programme be revived, however, the Federal Government needs to create certain favourable conditions. These include the development of a financial strategy for incubator tenants, and the creation of a data base describing the availability of private capital. Further tax incentives for investment in incubator tenants are also needed. Without strong private financial support, incubator tenants face an increasingly uncertain future, a future made less promising by the current intense Government involvement in the ownership and operation of incubators.

9.5 Case Studies

Lagos Technology Incubator Centre

The Lagos TIC is located on a renovated dairy farm complex owned by the State Government of Lagos. The renovation of the facility cost about US $1.3 million, most of which was provided by the State Government. The incubator was originally managed by the National Technology Business Incubation Foundation (as had been the case with the two other Nigerian incubators), with support from the national implementation committee and a governing council made up of local personnel for each incubator.

The Lagos TIC contains about 5,000 sq. metres, of which 3,561 sq. metres was rentable. The facility consists of an administrative office and four prefabricated metal buildings that housed tenants in 22 identifiable units. All units were allocated to businesses, but only 11 were occupied. A technological orientation was the major criterion for admission.

Rentals were graduated from US $60 per sq. metre per year in the first year, rising to $150 in the third year. The rising rental rate was designed to ensure tenant turnover and provide support for new businesses by discouraging current tenants from staying on. No tenant had yet graduated prior to the nationalization. The 22 admitted tenants, with an average of six employees per tenant, were in four major sectors—metal fabrication, chemicals, food technology and services.

Services available to the tenants included typing, photocopying, and management training. The management training programme, comprising four modules–Management Appreciation, Understanding Finance and Accounting, Basic Marketing Skills, and Improving Production Performance–was offered in February 1995.

After four years of operation, the Lagos incubator reached only 50% occupancy. Whereas the incubator was originally charged with being financially self-sufficient in three years, a realistic assessment indicates that,

based on operating practices prior to nationalization, self-sufficiency was actually in excess of five years in the future. The lack of self-sufficiency begins with rent collected, as it represented only 10% of total operating expenditures. The Lagos incubator took steps to develop a resource network, but that activity was limited to the financial community.

Kano Technology Incubator Centre

The Centre began operations in late 1994, at first temporarily in the sheds of cooperative buildings. Renovations cost about $6,000. Managed by the Foundation, the incubator has a total space of about 400 sq. metres, partitioned into 18 units, 16 of which are about 10 sq. metres. Two larger units are each about 15 sq. metres. Rent was set at US $30 and $45 per year for smaller and larger units respectively, and the services offered were limited.

Eight units were assigned to businesses in the following sectors: leather products (4), a television aerial manufacturer (1), chemicals (2), and an earthen brick manufacturer (1). Two leather companies, unlike the other tenants, manufacture products using traditional technology. Two prospective tenants, both with masters' degrees, planned to start operations at the incubator at the end of April 1995. No tenants had graduated prior to nationalization.

10 POLAND

10.1 Overview

Poland and other European countries are in a process of transition aimed at developing a market system based upon entrepreneurship, and at establishing a democratic political system. In 1989 the most serious problems in the Polish economy were ineffective economic systems, macroeconomic non-equilibrium, and past-due foreign debt. Government policies since that time have been directed towards inflation control and supporting the transition to a free market economy. The results after six years are:

- Galloping inflation curbed (down to 30% in 1994)
- Elimination of long queues at stores, and the accompanying lack of goods
- Strengthening the Polish Zloty, which is now convertible
- Dynamic development of the private sector
- Improving the organizational structure of the Polish economy through supporting the creation of nearly 2 million small and medium enterprises; employing 60% of total labour power, and a source of 50% of the gross national product
- Achieving sustained economic growth (up to 4.5% in 1994)
- Changing the sectoral makeup of the Polish economy (the service sector share increased from 38.4% to 46%)
- Transformation of the banking system and creation of new financial institutions

The greatest cost of this process, however, has been increased unemployment, now standing at 15.5% (2.8 million unemployed among 40 million Poles). In Poland, the main impetus for the development of incubators has been the creation of jobs for people displaced in the transition from a communist to a capitalist economy. A variety of programmes are currently operating around the country with national and international funding.

10.2 Small Enterprise Support

Polish support for small enterprises occurs largely under the aegis of five programmes. These are: the Polish American Micro-Enterprise Development Project, the SCI-TECH Reform Programme, a portfolio of projects developed in collaboration with the Polish and British governments, an EC-funded SME development programme operating at the provincial level, and the STRUDER-PHARE programme.

The Polish Government, in November 1994, approved a document that described national policies with regard to business incubators, science and technology parks, and innovation centres. A second SME policy statement, approved in June 1995, contains recommendations for developing both the infrastructure for entrepreneurship and the promotion of innovation. In the wake of these statements, Government ministries have prepared detailed operational plans to complement and support the activities of the programmes listed below.

Polish American Micro-Enterprise Development Project

In 1993 the Polish Ministry of Labour and Social Policy initiated a programme to promote self-employment and micro-enterprise formation. This programme targets the unemployed in the creation of new jobs, and

attempts to reverse the general trend toward unemployment in the economy. The programme plans to establish advisory and assistance centres in thirty communities by mid-1996. These Small Business Advisory Centres (SBACs) will provide technical assistance through companion Enterprise Development Funds (EDFs) and business incubators. Consultants to the project are American and Polish experts who work as a team. The programme establishes special relationships with local labour offices to encourage the unemployed in utilising these special services. This project is part of the national Employment and Service Project, funded through a loan from the World Bank. It allocates moneys for investment and loans and equipment for small businesses. This is one of 10 different SE projects organised by the Ministry of Labour and Social Policy.

SCI-TECH Reform Programme

The aim of this programme is to promote Poland's scientific and research potential, with a view toward strengthening scientific output commensurate with the country's planned requirements and projected economic growth. In 1995 this programme created a sub-programme known as INCOME. The latter focuses on generating business projects recommended by technology and innovation incubators. By 1996, three to four centres under the umbrella of SCI-TECH will be accredited by the Foundation for Polish Science. Subsidies for high-tech projects will be released by the Foundation upon the accreditation of these centres.

Polish-British Enterprise Projects

Polish-British government projects focus on promoting small enterprises in two provinces in Eastern Poland—Lublin and Bialystok. These projects are grouped into four main categories:

- Creation of development infrastructure incubators
- Investments in Capital Fund projects, aimed at helping enterprises by means of capital investments
- Credit Guarantee Fund-supported projects
- The Market Development Programme, aimed at helping small enterprises access markets domestically and internationally

SME Programme and the Private Sector Development Programme

Financed by the Commission of the European Communities (PHARE), these programmes are under the supervision of a council composed of representatives from different ministries, the Parliament, private sector organisations, and a representative of the EC Commission. Both programmes provide support to selected Polish institutions in 25 provinces, offering advisory and training services to small and medium enterprises. The supported institutions are chosen by open competition.

As a result of this assistance, there are 30 business support centres and four business incubators which have been developed by regional chambers of commerce and other institutions dealing with private sector promotion. Support centres provide consulting and training for small entrepreneurs, including help with business plans, loan applications, marketing, financing, trade, and accessing general information needed for their businesses.

STRUDER-PHARE Programme

Most of the funds in this programme are allocated for direct investment in small enterprises in six provinces. STRUDER, the Polish Agency for Regional Development, is a collaboration with PHARE and consists of the Donation Fund, the Guarantee Fund, and the Regional Investment Fund. STRUDER financially supports six business incubators in cooperation with foreign counterparts.

10.3 Incubators

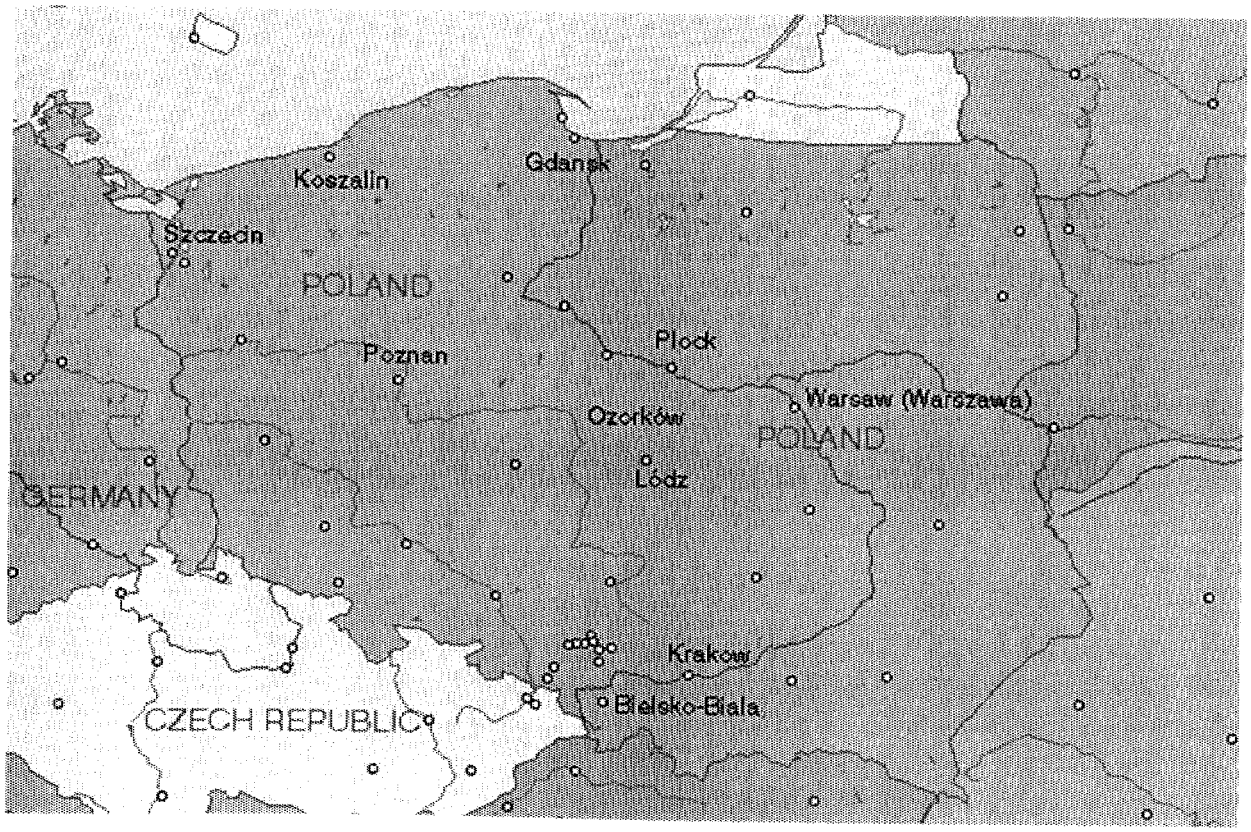
The concept of the business and innovation centre (BIC), modelled on those in Western Europe and the USA, vas debated for the first time in 1987 in Poznan, located in the mid-west of Poland. Contacts with the Berlin 'echnology Centre, the European Business and Innovation Centres Network, the German Association of Business nd Technology Centres, and the United Nations Development Programme were established. The former State)ffice for Scientific and Technological Development, with the help of the UNDP, financed the "Feasibility 'rogramme for Establishment of Technology Incubation Centres and a Master Plan for Technology Parks in 'oland." This feasibility programme was a critical step toward establishing business incubators in Poland.

In 1990, the first such centre, Wielkopolska Business and Innovation Centre Inc., was established in Poznan. 'he shareholders were: Governments of the four provinces constituting the Wielkopolska region, the local 'echnical University, the Poznan Chamber of Commerce and Industry, and the group Enterprise for Technical rogress Implementation. The main aims of the BIC in Poznan are:

- Utilising idle production halls to create locations for new businesses and innovators
- Developing the commercial/ scientific potential of the Wielkopolska region
- Promoting small and medium-sized enterprises

The business incubation idea became popular in Poland among the business and scientific communities, as ell as among administrative authorities. Next, funding was developed for four centres: the Innovation Centre o. Ltd. in Gdansk (November 1990), the Centre for Emerging Technology Enterprises Co. Ltd. in Warsaw Jovember 1991), the Centre for Entrepreneurship Promotion in Warsaw (December 1991), and the Progress and usiness Incubator in Krakow (May 1992). Today, as a result of the successes in these initial programmes, Polish ıcubators are scattered across the country (Figure 10-1).

Figure 10-1: Incubators in Poland



Establishing and sustaining a successful business incubation programme is difficult, no matter where the effort is undertaken. Similarities between problems confronting entrepreneurs in Poland and entrepreneurs in the US are evident. Among them are:

- Lack of affordable premises with the amount and type of space required
- Lack of seed capital or working capital
- Regulatory barriers and constraints
- General lack of support systems, networks, and appropriate business services

The first business incubators were focused on technology transfer, and on promoting innovative firms.

Table 10-1: Business Incubators and Technology Centres in Poland

Date Founded:	Technology Centres:	Business Incubators:	Total:
1990	1		1
1991	1		1
1992	0	7	7
1993	1	8	9
1994	1	10	11
1995	4	25	29

New incubators are aimed at solving unemployment problems and promoting entrepreneurship. Seven business incubators of this type were founded in 1992. By 1995, twenty-nine business incubators were offering small enterprises a combination of space and shared services. Four of those units are technology incubators. Other facilities are at earlier stages in the organisational process. Three of the original incubators were later converted to technology transfer agencies and exhibition centres (Table 10-1).

The average period of time necessary to develop business incubators in Poland is 27 months: 12 months for the concept preparation, six months for adapting the building, and nine months for soliciting and signing tenants.

Incubator Characteristics and Structures

Incubators are run by foundations (36%), associations (20%), and units of city governments (20%). In Poland these are the most attractive means of running business incubators, and the most effective means of the facilities realising their social missions. Other structures for incubators include limited liability companies and those under the umbrella of university departments. Foundations and associations are the only legal forms of non-profit organisations permitted in the Polish tax system.

The non-governmental organization (NGO) is a relatively new legal entity in Poland. Public policy and law are still being formulated to address the critical issues of what NGOs should and should not do, limitations of rights and powers, and what and how much of their revenues to tax. Additionally, many Polish NGOs are actually founded by the government. This phenomenon occurs at all three levels of the polity: local, provincial, and national. As the political landscape changes, many NGOs responsible for entrepreneurship promotion and incubator development are expected to be thrown into power struggles, organisational chaos, and fights over continued funding. One strategy for dealing with these problems is the establishment of politically inclusive foundations and associations. Such organisations invite a wide range of community leaders to participate, including those from both the right and the left, stemming—it is hoped—the potential for infighting and destructive competition.

A majority of incubators were started by local Governments. The Government generally provided start-up capital, finance for adapting the facility, and operating costs. Neither banks nor private partners are associated

with these incubator projects. In a few cases, provincial offices and chambers of commerce and industry are stakeholders. Two-thirds of the incubators collaborate with scientific institutions and universities that contribute in the preparation of feasibility studies and business plans. Scientists and researchers are also serving as consultants to incubator management, tenants, and clients. On average, the staff in these incubators consists of three persons, supported by four contractors.

According to managers of business incubators, local communities regard business incubators favourably. Three-quarters of the total groups interviewed in communities had a positive view of incubators and their collaboration with local institutions. The main barrier to the development of business incubators, however, as indicated by managers, is a lack of finance.

Business and innovation centres have become visible in every region of Poland (Table 10-2). Ten are operating in cities with over 100,000 inhabitants; four in towns with under 50,000 inhabitants (far from big cities); and ten in regions affected by high unemployment (running from 30-40% of the workforce). Only five are located in wealthy regions—including four technology centres—where the R&D sector is well-developed.

Table 10-2: Summary of Selected Incubators in Poland

	Opening	Area		Start-ups		Companies		Total	
Centre	Date	Avail.	Rented	No.	Empl.	No.	Empl.	No.	Empl.
Szczecinna		7,700	4,900	47	106	3	34	51	140
Ozorków	4/1/93	847	608	8	47	3	11	11	58
Lódz	12/1/92	2,800	1,883	18	65	7	32	27*	95*
Gdansk	12/22/94	500	410	—	—	8	26	8	26
Plock	na	600	600	3	4	1	1	6*	13*
Warszawa	1991	1,500	960	7	23	11	51	19*	78*

Note: * *includes universities & institutes, not shown separately*
na not available

On the other hand, many problems are encountered in the development of technology incubators, including a lack of infrastructure for technology transfer and commercialisation, as well as a poor market for high technology products. Local sponsors of business and innovation centres are more interested in short-term solutions to the problems of unemployment than in developing high technology products. As a result, business incubators are developing rapidly, and technology centres are still in trouble.

The average gross building area of the business and innovation centres in Poland is 2,365 sq. metres (ranging from a low of 126 to a high of 7,700 sq. metres). Of this, 90-95% is leasable. In two-thirds of the incubators, managers plan to expand the space by nearly 50%. Most of the facilities were originally industrial plants. The average building is 37 years old—ranging from two that are over 100 years old to one that is new.

Overall, since its inception in 1994, the Polish Ministry of Labour and Social Policy incubator programme has got off to a quick start, with significant local and international support (Table 10-3).

Table 10-3: Status of Selected Ministry-Initiated Incubators, July 1995

	Space, sq. metres			Jobs Created	
Incubator	Total	Leased	Tenants	Month	Since Inception
Bielsko-Biala	3,911	664	11	36	76
Elk	1,000	321	8	71	67
Knurów	4,922	2,900	34	226	27
Koszalin	1,947	0	5	16	16
Kraków	4,045	2,717	27	257	45
Oszczeszów	2,800	1,718	10	220	220
Ozorków	1,603	538	11	58	21
Paslek	2,346	1,405	8	50	74
Radom	2,646	1,390	5	33	50
Tomaszów Ma	1,590	838	11	41	40
Zelów	1,267	893	7	51	41
Zary	400	153	5	142	181
Total	28,477	13,538	142	1,201	858

Note: totals based on unrounded numbers not shown

The average initial investment cost for Polish incubators amounts to US $100,000, with a range from US $4,000 to US $260,000. Average annual operating costs in 1994 were US $44,000, of which 18% was covered by rents, 21% by service incomes, 38% by subsidies from stakeholders, and 23% by other sources. Two thirds of the managers declared that financing sources for operating costs are too limited and need to be significantly expanded.

The average annual rent (excluding taxes) per square metre is listed in Table 10-4.

Table 10-4: Average Rents, Polish Incubators

Type of space	Avg. cost per sq. metre	Range
Production space	US $1.80	ranging from $0.43 to $6.52
Office Space	US $2.44	ranging from $0.65 to $6.96
Other	US $1.37	ranging from $0.43 to $3.48

In most of the cases rents are much lower inside than outside the incubator. The rents differ according to location of the building, as well as according to the lease provisions for standard or technical equipment. Reductions and progressive rents are commonly extended to new firms or to those created by unemployed people.

In all incubators shared services are available for tenants (Table 10-5). Specific components of an advisory assistance programme to guide business incubation in Poland will emerge from an overall regional strategy, based

n assessments of both existing incubators and the potential need for additional incubation activities. Such uidance would include:

- Training to build the capacity of existing incubators and other assistance to help them become more effective;
- Activities that enable business incubators to become significant contributors to restructuring and privatization in the regions;
- Effective linkages with programmes sponsored by international development agencies, so that Polish resources can be leveraged and their regional impact maximized.

Table 10-5: Shared Services for Tenants and Clients of Incubators

Service	Percentage of Total Number of Incubators	
	Directly from Incubator	Through Outside Network
Consulting		
1.Start-up, project evaluation	60.8	34.8
2.Business Planning	56.5	56.5
3.Technology	43.4	47.8
4.Patents and licenses	13.0	60.8
5.Finance	47.8	56.5
6.Accounting	47.8	43.5
7.Legal	65.2	17.4
8.Marketing	65.2	21.7
9.Training / education	60.9	34.8
Amenities		
10.Secretary	65.2	22.7
11.Telephone exchange	56.5	21.7
12.Telex, Fax	43.3	26.1
13.Copying	34.7	26.1
14.Desktop Publishing	47.8	34.8
15.Reception	47.8	21.7
16.Cafeteria	8.7	30.4
17.Conference Room	43.5	17.4
18.PCs	43.5	30.4
19.Common Workshops	39.1	26.5
20.Common Laboratories	21.7	26.1
21.Access to Databases	17.4	60.9
22.Library	39.1	26.1
Finance		
23.Own Capital / Venture Capital	8.7	13.0
24.Credits	18.2	27.3
25.Subsidies	36.4	18.4
26.Others	45.5	18.2

A review of six selected incubators provides an understanding of the commonalties and specialities of the service packages of individual incubators (Table 10-6).

Table 10-6: Services Provided by Selected Incubators in Poland

Service	Szczecin	Ozorków	Lódz	Gdansk	Plock	Warszawa
Consulting						
Start-up	C	C	C/N	C	C/N	C
Business Plan		C	N	C	C/N	C
Technology	N	N	C	N	C/N	
Patents and licenses		N	C	N	C/N	N
Financing	N	C	N	N	N	N
Accounting	N	C	C/N		C/N	N
Legal	N	C	C	N	N	N
Marketing	N	C	N	C	C/N	N
Education/Training	N	C/N	C/N	C	N	N
Amenities						
Secretarial	C	C	C/N	C	C	C
Telephone	C	C	C/N		C	C/N
Telex/Fax	C	C	C	C	C	C/N
Copying	C	C	C	N	C	C/N
Data Processing	C	C	C		C	N
Reception	C	C	C		C/N	C
Cafeteria	C		N			N
Conference Rooms	C	C	C	C	N	C/N
PCs	C	C		C	C/N	N
Common Workshop				N	N	C
Common Laboratory			C	N	C/N	C
Database Access		C	C/N	N	C/N	N
Library	C	C	N	N	N	N
Financing						
Own Capital / VC					N	
Credits		N	N	N		N
Subsidies		N	N	N		N
Other		N				C

Note: C *offered by incubator*
N *brokered by incubator with independent supplier(s)*

At the beginning of 1995, the 29 Polish incubators had 331 tenants with 1,582 employees. Sixty-eight percent of the firms were new, less than a year old when entering the incubator. They created 57% of the above-mentioned jobs (Table 10-7).

Table 10-7: Tenants of Business Incubators and Technology Centres

	Tenants	Jobs	Space (sqm)
Tenants			
New Firms	224	899	18,197
Other Firms	81	560	10,041
Institutions (including R&D)	26	68	1,625
Total	331	1,527	29,913
Graduates	70	343	

Most of the incubators contain six to ten tenants, with only one large incubator serving over 30 tenants (Table 10-8).

Table 10-8: Numbers of Tenants in Polish Incubators

# of tenants, range	# of incubators
up to 5	8
6-10	10
11-20	6
21-30	4
over 30	1

Tenants of business incubators are flexible, very often dealing simultaneously with production, services, and ıde. Insufficient numbers of tenants are developing new products and technologies, however, indicating weak-sses in Polish business incubators and technology centres. New entrepreneurs entering the business incubator :, on average, 36 years old, largely male, with 2.5 years experience in their own business. For 20% of entrepre-urs, this is a new activity. The main advantages for tenants are: advisory services in start-up, marketing and v, as well as close contacts with other entrepreneurs. Nine potential tenants apply every month to each incuba-:. Thirty per cent of applicant projects are deemed worthy of developing, thus justifying some sort of continued ntact between them and the incubator even if there is no immediate vacancy.

Entrance criteria differ among incubators, but the most common is a recognition of the prospective tenant's tential for creating new jobs. A secondary criterion is a preference for firms founded by inhabitants of the local mmunity. Most incubators accept anchor tenants, which makes for greater financial stability of the facility.

ganization and Operation

Business and innovation centres have different organisational forms and functions:

siness incubators (totalling 25):

- Provide relatively inexpensive production and office space
- Provide technical and office services and workshops to small enterprises
- Assist in solving unemployment problems
- Were mostly started locally without external support, whereas new incubators are financed by the Polish Ministry of Labour and Social Policy, the World Bank, the PHARE and STRUDER programmes, and the Governments of Great Britain, Belgium, the Netherlands and Japan.

Technology and innovation centres (totalling 4):

- Are connected to universities and scientific centres (Poznan, Warsaw, Gdansk, Plock)
- Encourage new and existing enterprises to locate their activities at universities, in order to foster co-operation toward the commercialization of their scientific research
- Provide space, infrastructure and services to small enterprises founded mainly by scientists
- Cooperate with foreign centres and other organizations, particularly those dealing with technology transfer
- Are mainly financed locally, with new projects in Gdansk and Koszalin co-financed by the German Government.

Business support centres (totalling 50) focus on solving local economic and social problems by:

- Training technical people and researchers in how to start their businesses, and how to develop their enterprises in a free market economy
- Searching for and evaluating new business projects, while providing technical, economic, financial, legal and other forms of consulting
- Locating financing for business projects, and securing capital
- Business planning
- Technology transfer
- Use of idle production rooms to provide space for new businesses

Meeting a variety of new business needs by means of networking is the most important function of business and innovation centres, regardless of their size. While many communities in Western countries offer some type of assistance, in Eastern Europe assistance is often of poor quality. Approaching business assistance through a network of service providers also identifies weaknesses in delivery, or non-existent services that need to be created for economic development. By bringing needed services together in an environment in which entrepreneurs can interact and assist each other, the new business development process through BICs becomes synergistic.

In 1991, the Polish National Business Incubation Board, under the Ministry of Industry and Trade, prepared "A Programme for the Development of Business and Innovation Centres in Poland - 1991-1995". This programme recommends:

- Training of business and innovation centre management, and tenants
- Preparing manuals, books and leaflets on technology transfer, entrepreneurship promotion and innovation
- Creating 35 BICs
- Preparing legal, financial, and organisational support for BICs
- Creating domestic and international networks for business and innovation

Most of this programme has been realised despite financial problems and political instability. A solid basis for this activity was provided by local authorities, and by Government striving to overcome unemployment while managing the restructuring of the local economy. The central Government preferred to observe the process rather than to actively participate. Initiation of the business incubation movement was structured to be open to all people and institutions involved in entrepreneurship promotion, with local development as an important first step. In Autumn 1990, the first seminar on entrepreneurship promotion, economic development of regions, and managing business and innovation centres was held. This was followed by five annual conferences focusing on the theme of "The Role of Business and Innovation Centres in Small Business Promotion and Regional Development". The Polish Business and Innovation Centres Association was founded during the third conference in 1992.

International Cooperation

Assistance in the creation of business incubators in Poland was offered by many countries, international organizations and institutions. Some Polish groups collaborated with business incubators and other organizations in Europe and the US, including:

- United Nations Development Programme, helping the Polish Government prepare "The Feasibility Programme for the Establishment of a Technology Incubation Centre and a Master Plan for a Technology Park in Poland" (1990);
- The European Union, founding nearly 30 business support centres through PHARE, and four business incubators between 1991-1995 under the STRUDER programme; six more business incubators are planned, to be established in the near future;
- The World Bank and the Polish Ministry of Labour and Social Policy, financing the Micro-enterprise Development Project that started in 1993; this project includes the creation of 23 business incubators, 37 small business assistance centres, and 30 enterprise development funds by September 1996;
- USAID, involved in creating 25 small business assistance centres since 1991;
- The British Know-How Fund, involved in creating several small business assistance centres, and two business incubators;
- Foreign Governments, including the Governments of Belgium, Denmark, France, Germany, Italy, and the Netherlands, with one business incubator fully financed by the Japanese Government.

Government Initiatives

Polish institutions that have been particularly involved in the development of Business and Innovation Centres are: the Ministry of Labour and Social Policy, Ministry of Industry and Trade, the State Committee for Scientific Research, the Cooperation Fund (sponsored by PHARE), and the Polish Agency for Regional Development STRUDER). In November 1994, the Government approved publication of "The State Innovative Policy". In June 1995, the Government approved publication of "The Governmental Policy towards Small and Medium Enterprises." These documents are a hopeful and important step towards further developing business incubator and technology centres in Poland.

A pool of Polish managers of BICs, who can partner with foreign experts and advise newcomers in business incubator projects, was recently created. Polish experts can add their experience in business promotion and knowledge of the local environment to Western know-how. Such a Polish-American team is working effectively, for example, in the Micro-enterprise Development Project of the World Bank and the Ministry of Labour and Social Policy. However, Polish experts will need to develop local sources of financing, and provide support for BICs after foreign consultants are gone and their programme moneys are exhausted.

Polish Business and Innovation Centres Association

The Polish Business and Innovation Centres Association (PBICA) is a volunteer organisation, founded in 1992 by individuals working out of BICs, and by other institutions and organisations that join as associate members. The Association's goals are to:

- Improve the qualifications of the organisers and staff of BICs, as well as to promote their interests
- Promote scientific achievements and know-how through the organisation and operation of BICs
- Support technology transfer and innovation
- Promote the utilisation of vacant business facilities

- Undertake activities to adapt small and medium-sized enterprises to free market conditions, and to link them with the European Union
- Establish exemplary methods of both supporting entrepreneurship and reducing unemployment
- Promote new business and innovation centres

The Association realises its mission through creating information systems and publishing training materials. It also organizes meetings, lectures, training consultations, conferences, symposia, competitions and conventions. The Association is cooperating with other domestic and foreign organisations and institutions, as well as with local and central authorities, and science and research centres.

The incubation movement, which started at the local community level, is still the strongest foundation for establishing incubators, BICs and technology centres in Poland. The activities of the Association and its members resulted in: six annual conferences of Polish BICs, five manuals for BICs, lectures at conferences in Poland and abroad, training for business incubator organizers and managers (in 1994 alone there were six three-day training programmes in different districts of Poland), and a network of collaboration with governmental and national institutions around the country.

Although the PBICA is not subsidised by the Polish Government, governmental and other central institutions have demonstrated their confidence and support of the Association's events. For example, at the Ministry of Industry and Trade, the Task Force on Commercialization of Technology is chaired by, and consists mostly of PBICA members. PBICA collaborates with a number of international organizations, including the European Business Innovation Centres Network (EBN), the German Association of Business and Technology Centres (ADT), Innovation Centres in Eastern and Central Europe Work Group (ICECE), and the US National Business Incubation Association (NBIA).

European Cooperation

One of the most significant problems in the countries of Eastern and Central Europe is that of domestic policy of governments keeping pace with the entrepreneurial growth of their own countries. As a result, a group of experts founded the Innovation Centres in Eastern and Central Europe Work Group (ICECE). The main goals of ICECE for Eastern and Central Europe are the analysis of the environment for innovation and entrepreneurship activities, and the development of cooperation and international support for business innovation. Mutual cooperation of former Eastern bloc countries enables comparison not only of the problems they face, but of solutions that are working in each country.

Polish-German cooperation within ICECE resulted in creating cross-border technology centres between Berlin and Warsaw. The European Business Innovation Centres Network, a partner since 1990, is active within ICECE and played an important role in promoting this idea. Business and innovation centres in Poland and Germany are creating modern forms of cooperation between small businesses in the transfer of technology.

BICs in East Germany and in Poland are very much involved in developing cooperation networks. For instance, the collaboration between centres in Poznan and Frankfurt/Oder supports the technology park in Poznan. The German Ministry of Economy is co-financing the technology park project in Gdansk, while the Ministry of Research and Technology is supporting linkages between business centres in Koszalin and Neubrandenburg. The partnership Technology Centre Guben-Zielona Gora, was established in 1994, and the German-Czech-Polish Triangle project of the Business and Innovation Centre Nysa is under preparation. These projects are using the experience of other cross-border collaborations, including Germany/Austria (Frailassing-Salzburg), Germany/Netherlands, and Germany/Denmark (Niebull).

10.4 Conclusion

In Poland, broad interest has developed in promoting local economic development as a means of combating oblessness. Some of this interest is focused on new forms of promoting entrepreneurship in the guise of small and nedium-sized enterprises. Methods of promotion have included business incubators, innovation centres, business upport centres, and technology parks. For these methods to work, the State must participate in a central and co-rdinated way, using well-organized local institutions. An understanding of local economic conditions and of the arget population is crucial, not only for knowing the best way to organise a BIC, but also for building support in he community anchoring the effort.

Money is a critical problem at the present stage in the development of business and innovation centres in 'oland. Received foreign aid is targeted for the preparation of business plans, covering operating costs, and urchasing equipment for some of the centres. Consequently, finances for renovation of buildings must come 'om national sources, foreign-based credit lines for Poland, and private investors.

Despite the often unstable transition process toward markets in Poland, business incubators and technology :ntres have developed successfully. In the difficult environment of a transforming economic, political and social 'stem, the concept was effectively adapted. In developed countries, business incubators are just one of the ements constituting the infrastructure for promotion of entrepreneurship. In many communities in Poland they 'e the only institutional support for entrepreneurs and small businesses. Incubators have to play the role of other istitutions normally found elsewhere: chambers of commerce and industry, information centres, and training id consulting centres.

0.5 Case Studies

:czecin Entrepreneurship Centre

Szczecin is a city of 400,000 in north-west Poland on the Baltic Sea. The incubator was established by the ty Council of Szczecin in September 1991. As part of the recruitment campaign, 800 candidates for the incuba- r were interviewed. Three hundred of them submitted application forms and 60 were approved. This group of ospective tenants was trained in how to start a business. Of the group, 30 were approved by the Board of irectors—a member of the City Board, an alderman, the head of the credit department of a local bank, a repre- ntative of the Chamber of Commerce and Industry, and a researcher from the university. The City Council voted a 980 sq. metres building and associated renovation/adaptation funds to create the incubator, while iants adapting their own space received reductions in rent.

Presently, the incubator occupies two old buildings, 1,000 sq. metres and 6,700 sq. metres each, incubating a :al of 50 tenants and having produced 20 graduates. The Szczecin incubator is open to anyone starting a small siness, especially those who are unemployed. The goals of the incubator are:

- Improvement of the community through private sector economic development
- Creating entrepreneurship
- Vocational retraining
- Attracting well-educated professionals
- Aiding handicapped people

The management and staff of the business incubator are involved in the preparation of a local development ategy to create a network for small business promotion. Most of the applicants to the incubator expect cheaper

space, telephone services, access to clients and international contacts, and an improved image. Because City Council subsidies only partially cover the operational budget, rents are rather high compared to other incubators in Poland.

From the beginning, the incubator management worked to reduce public moneys in the operational budget. Each year the percentage of the budget requiring subsidy has been getting smaller. In 1992 it was 84% of the budget; by 1994 it had been reduced to 60%. The management also calculates the total economic impact on the city and state budgets; for example, the unemployment benefits saved because the unemployed have jobs, and the taxes paid by employees. The economic benefit exceeds the cost of subsidies by nearly three times—US $365,000 versus $129,900 of subsidy. The success of the first incubator in 980 sq. metres convinced the City Council to devote an additional 6,800 sq. metres to the facility in 1994.

Business Incubator, Lódz

The City of Lódz has 1,000,000 inhabitants and is located in central Poland. Before 1990, Lódz province was the centre of the Polish textile industry. Primary markets were Poland and the Soviet Union. When the socialist system collapsed in 1989, the rate of unemployment in the whole region rose to one of the highest in Poland. Production had to be reduced in response to the disappearance of established markets.

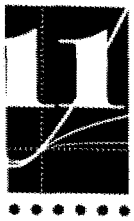
The Business Incubator Foundation was established in 1992 by the Provincial Government of Lódz, the Lódz City Council, and the Agency for Regional Development in Lódz. Its goal is to create a network of business incubators and a technology park in Lódz province.

The Foundation started two incubator projects, one in Lódz and the other in Ozorków, 25 km from Lódz. In 1994 the incubator in Ozorków formed a new independent foundation. Preparation for the incubator project took six months. The main problem was the ownership of the facility—in Poland, real estate ownership was not well regulated before 1989. Finally, a 120 year-old building, located in the centre of the city, was made available to the incubator project. The 2,800 sq. metres building was in bad condition and needed much money for renovation and conversion to 2,500 sq. metres of leasable space. The incubator opened in December 1992. Rents cover 30% of the operational budget while 10% is covered by service fees. The 60% balance is subsidized. The budget covers operations but is not adequate to further develop the incubator facility, which needs at least 80% more funding. The incubator supports 27 tenants and is responsible for 10 graduates.

The incubator in Lódz provides business services via its own staff and through a network of outside service providers. The foundation, however, has yet to establish a loan fund. Half the tenant firms in the facility are growing very fast. During 1994, firms in the incubator increased their turnover three times and their employment over 100% on average. A third of the firms are profitable, but are not growing. Two tenants who entered the incubator in 1992 with seven employees, graduated to larger facilities in 1993. Their current combined employment is 100.

The incubator in Lódz took the first steps towards creating a business cooperation centre, a high-tech incubator, and an ecological incubator. These three operations will be located in one facility in the centre of the city. Development plans for these projects are nearly completed. Foreign partners, as well as funding from the STRUDER programme, will contribute to these initiatives. Additionally, a feasibility study for an agro-industries park in Strykow (30 km from Lódz) is being prepared. Strykow is an agricultural area where the North-South and East-West motorways will soon intersect.

The Incubator in Lódz is successful and is one of the best in Poland. The local environment is friendly and supportive, and outlook for the Incubator Foundation in Lódz seems to be favourable.



TURKEY

11.1 Overview

Many countries attempt to link incubator programmes with local and regional universities, as such linkages are an effective way to bring small enterprise development together with a ready pool of talent and expertise. Turkey has perhaps gone furthest down this route of all the countries examined here, in its vision of the university as an entrepreneurial institution. All current and planned business incubators operating in Turkey are university-oriented, with the sole exception being the one at Gebze. They all utilize the resources of the university to promote innovation and diffusion of new technologies as a means of industrial restructuring. To facilitate this relationship, upgrade the effectiveness of SEs, and to assist the university with becoming more entrepreneurial itself, the Government established KOSGEB, the Small and Medium-Scale Industry Development Organization in 1990. KOSGEB is the only Turkish organization that finances the operation of business incubators as a tool to promote small and medium enterprises. It, and SPO, the State Planning Organization, act as a bridge linking universities, incubators, and industry.

Although the business incubator concept is new to Turkey, the SME sector has historically been supported in a variety of ways. Privatization and efforts to enter the EU Customs Union have also made businesses and policymakers aware of the need for more concerted SME policies and programmes. Substantial Government funding for incubators is, as a result, now available, and interest in incubation is increasing in every province of Turkey.

At the moment there are 57 universities wanting to set up some type of centre, often with the hope of finding finance for their industrial R&D projects. Looking at the national economy overall, the reasons for the establishment of incubation centres with Turkish universities can be summarized as follows:

- The bulk of the population is under 22 years of age, i.e. college age or younger
- Unemployment is at 12% and new jobs are needed urgently
- Privatization and membership in the EU Customs Union require private enterprise that can compete at a global level—this means access to new sources of information and knowledge
- Since human resources are the key to development and it takes time to create these resources, institutions of higher learning are best equipped to take on long term education and training responsibilities

University-based technology development centres are thought to best address the above circumstances. Although judgement on the success of these centres may be premature, experience suggests that university-based incubators are a good tool for creating technology-based firms. For example, one business in the Istanbul Technical University (ITU)-KOSGEB centre, Altinay Robot, started an industrial robotics business in the absence of such commercial technology in Turkey. Now, the company has orders totalling US $300,000. Similar successes can be seen at the Middle East Technical University (ODTU)-KOSGEB centre. One company exported US $500,000 worth of products and another created jobs for 19 persons at a cost of $1,809 per job.

11.2 Small Enterprise Support

Turkish businesses are characterized by the size of the operation, based either on asset value or on the number of workers employed (Table 11-1). The 1990 Census revealed SMEs accounted for 99% of all enterprises nation-

ally, but only for 25% of the value-added ones. Thus, SMEs are pervasive, but have only a modest economic impact overall. Large enterprises, although less than 1% in number, constitute 47% of all employment, and 75% of all value-added services provided in the Turkish economy.

Table 11-1: Enterprise Size Definitions in Turkey

	Industry	Workers	US $000's Assets
KOSGEB	Small	1-50	
	Medium	51-150	
	Large	151+	
Halk Bank (1992)	Small	100	$25
	Medium	101-250	$26-125
	Large	251+	$126 +
SIS (1991)	Micro	1-9	
	Small	10-49	
	Medium	50-99	
	Large	100+	

KOSGEB

The national instrument for SME support is KOSGEB, established by Special Law 3264 in April 1990. Its objectives are as follows:

- Improve the efficiency of SMEs and increase their competitive advantage
- Improve the performance of SMEs with technical assistance programmes, including training
- Help SMEs in the adoption of modern production processes, production specialization, product design, and quality management methods
- Promote development of strategic alliances between large manufacturing firms, with SMEs as subcontractors and ancillaries
- Support innovation and encourage entrepreneurship
- Direct and orient public development investments for maximum benefit

To promote these objectives, KOSGEB has established eight kinds of service centres:

1. **Consultancy and Quality Improvement Centres:** technical support directed to quality issues in the context of domestic and foreign competition, including access to full-capability testing laboratories on issues of production planning, materials selection, product and process design, and management.
2. **Development Centres:** technical support for specific industries, such as foundries, plastics, rubber, woodworking and furniture, food, electrical/electronics, textiles, and metals.
3. **Technology Development Centres and Technoparks:** information on acquisition and implementation of advanced technologies; short-term access to business premises with some facilities, including telephone,

fax, computer, and secretarial access/support; technical and financial consultancy developed with both local and foreign experts; general information on Governmental rules, regulations and legislation.

4. **Marketing Research Centres:** analysis of local and foreign markets, promotion of SME products, export promotion, strategic alliances.
5. **Training Centres:** technical, professional and skills training provided to managers, university graduates and vocational staff; programmes expanded through mobile facilities.
6. **Information Centres:** Ankara, Istanbul, and Izmir Centres form the focal points for data on investment, markets, technology, finance, legislation, and SME support programmes, with on-line access to ministries and databases.
7. **Investment Orientation Centres:** help entrepreneurs prepare economically feasible projects, including job descriptions and project profiles.
8. **Common Workshops:** facilities with equipment for die making, heat treating, machining, grinding, forming, cutting, brazing, soldering, welding and bending.

KOSGEB plans expansions in the nature and scope of its operations over the next few years. Listed below is a ampling of the programmes planned for implementation and expansion:

- **University-Industry Cooperation Programme (1995):** university technology for industrial applications, and industry problems targeted for university research
- **University-Company-Consultant Programme (UNFID):** directed to specific projects, this programme is in concert with the Cooperation Programme (above)
- **Entrepreneurship Development Programme (1995):** focusing on technology-orientation, training, women's issues in small business, and research to identify new and emerging investment areas
- **Technology-Oriented Initiatives (Technology Development Centres):** interactive training for the preparation of work plans, and business administration consultancies
- **Labour Redundancy from Privatization:** five business incubation centres, established under a World Bank project, offering consultancy and training packages covering the span from idea generation through to the opening of a business
- **Provincial Level Training Centres(10 provinces):** site selection with potential for incubator locations under World Bank sponsorship (see #5, above)
- **Subcontracting Industries Development:** using subcontracting to develop SMEs into large enterprises employing state-of-the-art technology
- **TAYSAD-KOSGEB, Automotive Subcontracting Industries Development (1992-96):** continuation of above subcontracting activities specifically for automotive industry suppliers
- **AKSAN Machine-Tool Subcontracting Industries:** work strategy identification to correct excess indirect labour costs, low production capacity, and limited utilization of installed capacity
- **Small Enterprise Estates (SEEs):** provision of specialists, training and consultants to create an environment conducive to entrepreneurial activities through the establishment of SEEs, business centres, and enterprise support offices directed toward the formation of joint ventures between businesses in Turkey and the republics of the Newly Independent States
- **Balkan Countries Cooperation:** SME cooperation among Albania, Bulgaria, Greece, Romania ,and Turkey, and including the establishment of a system of information exchange concerning import/export issues, joint ventures, technology transfer, training, consultancy, and technical assistance

- **Textile Machinery:** replacement of existing looms through a leasing programme designed to increase capacity and ensure quality
- **Durable Consumer Goods:** analysis of ways to expand SME subcontracting to durable goods producers through provision of consultancy and training programmes
- **CE Mark Certification:** programmes to help SMEs meet the quality standards of the European Union
- **Export Development-Istanbul Pilot Zone:** consultancy support to meet the opportunities afforded by trade with the EEC and EFTA
- **Eastern Black Sea Region Weapons Conversion:** re-establish economic and social equilibrium in the weapons industry conversion process, with an initial focus on manufacture of pistols
- **Rural Industry Development and Implementation:** consultancy to support product diversification and growth in Bartin, Kastomonu, Sinop, Çankin, Çorum, Sivas, Tokat, and Yozgat
- **Jewellery Manufacture-Kars Region Obsidian:** workshop established to manufacture jewellery from newly discovered mineral deposits
- **Uçak Region Handicrafts:** construction of carpet-washing facility at Eçme with continuing support to increase market share
- **Anatolian Traditional Rug-Weaving:** development of rug-weaving, including quality improvement, cost reduction and targeting increased exports, beginning in Amasya and eventually expanding to Çankin, Çorum, Sivas, Tokat, and Yozgat
- **Glass Industry Efforts:** feasibility studies, market research, and provision of consultancies to improve quality and initiate exports, focusing on the Sivas area

A number of other organizations in Turkey work either with KOSGEB or under its umbrella to improve university-industry relationships, and to promote SMEs through university incubators. They include the following:

Türkiye Halk Bankasi-People's Bank of Turkey. The bank has five areas in its programme for small business support: cooperative ventures, industrial organizations, development funds, women entrepreneurs and young entrepreneurs.

Turkish Foundation for Small and Medium Businesses (Tosyöv). Tosyöv was founded in 1990 to service 60,000 SMEs and to provide: stable infrastructure; equitable incentive systems; adequate financial resources; investment opportunities; advanced technology equipment (tools, apparatus, materials); training and consultancy services to encourage production of high quality goods and services; training in modern management; efficient relations between main and ancillary industries; widespread education to better enable integration into the European Customs Union; positive public opinion and broad political support; and, organizational networks for SMEs.

Tosyöv also created a network of 1,500 registered members, 17 support associations, and branch offices in Istanbul and Izmir. Service units include:

1. Turkish Grand National Assembly SME Working Group
2. SME Consultancy Service Project Coordination Centre
3. Tosyöv Foreign Trade Consultancy and Profile Company
4. Credit Guarantee Fund Company
5. Tosyöv Press Centre
6. Tosyöv Legal Consultancy
7. Tosyöv Financial Consultancy
8. Cooperation with the Foreign Retired Expert Organizations

Technology Development Foundation of Turkey (TTGV). TTGV, a public and private collaborative enture, was established in 1991 by 40 funders contributing US $300,000, supplemented by a US $43,300,000 World Bank loan. It exists to:

- Encourage increased private investment in R&D
- Provide funds and expertise for projects to enhance technological infrastructure
- Identify technological research areas, and either fund or contract for such research
- Strengthen selected global trade positions
- Strengthen the ties among industry, academia, and other public and private research organizations

TTGV programme activities include technology development, strategic local points development, and international cooperation.

Medium and Small Enterprises Board (OKIK). Under the Union of Chambers of Commerce (TOBB), this dvisory board was established in 1988 to provide coordination and leadership functions. OKIK operating ructures include a marketing group and a technology board, as well as a committee of the whole.

National Productivity Centre (MPM). Established in the early 1950s as a public agency to improve the oductivity of industrial enterprises, the MPM does not provide services to individual enterprises, but rather rgets all enterprises without preferential treatment for one over another.

Turkish Standards Institute (TSE). Created to set Turkish industrial standards and to conduct quality ntrol as a means of assisting in the standardization of industrial products.

National Scientific Research Institute (Tübitak). Founded in 1963 as a public research institute to conduct ientific research, monitor technological developments in other countries, pursue technological development of ecific products, conduct seminars on scientific issues, and provide technical advice to industry.

State Institute of Statistics (DIE). Support for SME development includes the application of household rveys, with rapid turnaround in the processing of data.

Foreign Economic Relations Board (DEIK). Founded in 1986 to improve external economic relations and cilitate integration with the world economy through bilateral business councils.

Export Promotions Centre (IGEME). Established to prepare reports on the development of trade in foreign arkets, to coordinate business relations and organize trade fairs.

General Directorate of Apprenticeship Training. The General Directorate provides for business and cational training. It is mandated to open apprentice training centres in industrial estates with more than 100 terprises.

onomic Policies and National Plans

Local and regional economic plans, and plans for the operation of the aforementioned individual agencies, are in the context of the national development schemes of the country. The locus of Federal Government support SMEs is KOSGEB, located within the Ministry of Industry and Trade. Additional SME support is provided m within the Ministry through the General Directorate of Industrial Estates. While no financial institution ely focuses on SME issues, the Bank of Turkey (THB) has a specifically targeted support component for this as t of its mission.

Alternative tools for economic development include the following major initiatives: small business assistance ntres, operating from 1968-72 under KÜSGEM; training programmes; loan and equity funds; tax concessions; nts to individual SMEs; industrial estates; and incubators. Industrial estates (Table 11-2) provide the focal nt for entrepreneurial support to aid in the provision of services. They also increase the effectiveness of testing, ality, training, and business advisory activities. The goals of the estates include employment creation, productivity enhancement, stimulation of local and regional development, and industrial dispersion (de-urbanization).

Table 11-2: Small Industrial Estates, Turkey

	Project	Workshop	Employment	Total Cost US$ millions Foreign	Total	Job
Completed Projects						
Completed 1965-92	242	60,977	365,862	19.5	695	1,900
1993 Programme	137	37,883	227,298	13.3	434	1,909
Ongoing Projects	129	36,582	219,492	13.3	420	1,914
1993 completion	18	4,212	25,272	1.8	36	1,425
Post-1993 completion	111	32,370	194,220	11.5	384	1,977
New Projects	8	1,301	7,806	- -	14	1,793
TOTAL	379	98,860	593,160	$32.8	$1,129	$1,903

While industrial estates are concentrated near Istanbul, they are found in, or planned for, four other cities.

11.3 Incubators in Turkey

A brief description of Turkish incubators, many known as Technoparks, provides a context for the development of incubation in Turkey (Table 11-3).

Table 11-3 Turkish Incubator Affiliation

Incubator	Location	Affiliation
1. Marmara Research Centre Technopark	Istanbul	MRCT
2. ITU-KOSGEB Technology Development Centre	Istanbul	ITU-KOSGEB
3. ODTU-KOSGEB Technology Development Centre	Ankara	ODTU-KOSGEB
4. Anadolu Technology Research Park	Eskisehir	ATAP
5. Izmir Technopark	Izmir	ITAS
6. Technology Development Centre	Trabzon	KTU-KOSGEB
7. Technology Development Centre	Ankara	AU-KOSGEB
8. Technology Development Centre	Istanbul	BU-KOSGEB
9. Ankara Technopark	Ankara	
10. Istanbul Technopark	Istanbul	
11. Alçati Technopark	Izmir	

Marmara Research Centre Technopark (MRCT). Located in Gebze, 40 km from Istanbul, this 7.3 sq km research centre is the largest in Turkey. Founded in 1972, MRCT has 18 research units, two institutes and a staff of 835 carrying out a basic and applied research mission.

ITU-KOSGEB Technology Development Centre. The Istanbul Technical University campus is the site of this two-building centre, (1,150 sq. metres and 1,500 sq. metres, respectively) which uses part of its facility for training purposes.

ODTU-KOSGEB Technology Development Centre. Sited on the campus of Middle East Technical University in Ankara, this 4,500 sq. metre building was opened first as a research facility.

Anadolu Technology Research Park (ATAP). This new, two-storey building has a first floor used for academic purposes, and is located on the grounds of the Anadolu Technical University in Eskiçehir.

Izmir Technopark (ITAS). Located on the Aegean University campus in Izmir, this two-storey building has remained vacant since its completion in 1992.

Technology Development Centre, Trabzon (KTU-KOSGEB). After renovation, the first floor of a university building will function as an incubator.

Technology Development Centre, Ankara (AU-KOSGEB). Two floors of a four-floor university building will, after renovation, be devoted to incubation.

Technology Development Centre, Istanbul (BU-KOSGEB). This incubator will be located on the campus of Bo Aziçi University, although a building has yet to be identified and renovated.

Incubators in Turkey are located near three urban centres (Figure 11-1).

Figure 11-1: Concentration of Incubators in Turkey

These incubators are characterized by small staffs led by retired engineers (Table 11-4).

Table 11-4: Turkish Incubator Staffing

Incubator	Manager Professional	Other	Background	Age
MRCT	1	1	Mech.Engr	
ITU-KOSGEB	4	3	Chem.Engr	retired
ODTU-KOSGEB	4	3	Mech.Engr	37
ATAP	1*			
ITAS	3*	9	Mech.Engr	retired

* *part-time currently, anticipate full-time soon.*

Incubators provide a new initiative in the support of economic growth in Turkey. Facilities range in area from an initial 1,000 sq. metres to more than double that size (Table 11-5).

Table 11-5: Incubator Building Areas

Incubator	Building Area, sq. metre		Net %	Tenant		Common	
	Gross	Net	Gross	sq. metre	%	sq. metre	%
MRCT	*na*	*na*	*na*	*na*	*na*	*na*	*na*
ITU-KOSGEB A	1,149	594	52	114	10	441	38
*B**	1,493	496	33			387	26
ODTU-KOSGEB	3,250	1,362	42	207	6	1,681	52
ATAP	1,458	858	59	158	11	442	30
ITAS	1,530	494	32	90	6	946	62
TOTAL	8880	3804					
*KTU-KOSGEB **	*650*	*207*	*32*	*50*	*8*	*393*	*60*
*AU-KOSGEB **	*570*	*216*	*38*	*192*	*34*	*162*	*28*

Notes: na = not available
** = planned*

Direct business assistance programmes are evolving in Turkish incubators, with a number of new services planned (Table 11-6).

Table 11-6: Turkish Incubator Assistance Programmes

	MRCT	ITU	ODTU	ATAP	ITAS
Business Planning	P	P	P	P	P
Financial Management / Cash Flow	P	P	P	P	P
Markering & Sales	P	X*	X*	P	P
International Trade	P	X*	X*	P	P
Legal Matters	P	P	P	P	P
Technical Counselling	X	X*	X*	X	X
Laboratory & Workshop Services		X**	X**		
Laboratory & Workshop Materials		X***	X***		
Training	X	X	X	X	X
After-Graduation Services		X	X		

P = Planned / X = Existing

no asterisk	*10-30% of cost charged to client*
*	*50% of exhibition costs charged to client*
**	*10-20% of cost charged to client*
***	*supported via national entrepreneurial support regulations*

Incubators offer modest to comprehensive business development services. Most offer the full range of facility-related services (reception, mailing), with one carrying service to the limit through offering overnight accommodations (Table 11-7).

Table 11-7: Turkish Incubator Services Offered

	MRCT	ITU	ODTU	ATAP	ITAS
Secretarial Support	I				
Phone Answering	I				
Mailing	X	X	X	X	X
Word Processing	X	X	X	X	X
Printing	X	X	X	X	X
Plotting		X	X		
Fax	X	X	X	X	X
Photocopier	X	X	X	X	X
Document Binding		X	X		
Computer Network		X			
Work Station		X			
PC Support		X	X		
Office Furniture		X	X		
Parcel Service		X			
Meeting Room	X	X	X	X	X
Conference Room			X		
Exhibition Facility			X		
Library		X	X		
Video	X	X	X	X	X
Audio-Visual Conference Facility		X	X		
24-hour access	X	X	X	X	X
Security	X	X		X	X
Access to University Laboratories	X	X	X	X	X
Rental of Equipment	X	X	X	X	X
Common Workshop			X		
Storage Space			X		
Loading & Unloading Facility	X				
Utilities:					
Heating	X	X	X	X	X
3-phase Power	X	I*	I*	X	X
Water				X	
Other					
Library	I				
Recreation & Sports Centre	I				
Lunch, US $ per person	$3.00				
Overnight accommodations, US $	$15.00				

X *provided* P *Planned* I *included in rent* * *max 10 kW*

Rental rates vary by more than an order of magnitude within the country—from the local market rates down to 10% of market (Table 11-8).

Table 11-8: Turkish Incubator Rental Rates

Incubator	Rent, US $/sq. metre/month	Comment
MRCT	$3.00 office; $2.00 workshop	market rate
ITU-KOSGEB	$0.30	10% of market rate
ODTU-KOSGEB	$0.30	10% of market rate
ITAS	$4.00	above market rate
ATAP	$2.00	below market rate

Incubator tenants in Turkey tend to focus on high-technology products and processes, largely because of the university link (Table 11-9).

Table 11-9: Turkish Incubator Tenants

ODTU-KOSGEB

Tenant	Business
Kardiosis	computerized electrocardiograph systems
Ortana	power generators, solid state switching voltage regulators; large LED displays
Gate	PC boards, electronic test and trouble-shooting equipment
On	solid state thermoelectric devices
EBI	electronic measuring equipment, especially flow metres and data logging devices
AKTIM	chip-cards for food vending
Elimko	fuzzy logic algorithms and control hardware
Orta Dogu Yazilim	educational computer software
Esta	electronic water dispensers with photocell activation
Emsa	chip-card controllers
Nisan	storage and analysis of medical images on digital media
Talcom	direct broadcast satellite system design
Hakan	agricultural equipment design
Inter	HF/SSB army tactical radio performance testing and analysis
Karuzel	medical equipment
STB	industrial design
Elektra	personal computer add-on cards
Erran	software for placement/lay planning
Karina	fire protection systems
CIS	fibre optic systems

MRCT

Tenant	Business
HES Makine	fibre optic systems
AK-SA	new and economical ways to manufacture magnets
Poly Metal	high precision casting methods
Saygin Aritma	flash spectroscopy
Karagöz	aluminium can recycling technology
Orfen	surgical equipment
Olcusan	automation systems
Veritas	non-polluting aerosols
Biomar	monoclonal antibodies
Mekatronik	industrial automation and robotics

ITU-KOSGEB

Tenant	Business
Altinay Robotik Otomasyon.	**industrial robots**
Armas-Arikan Makina	high performance compressors for brake devices
Beta	**non-destructive inspection methodologies**
Elo Elektrik	computer-aided manufacturing systems
Eta-Asic Tasarim Merkezi	application specific integrated circuit (ASIC) design
Bilgisayar Aglari Merkezi	advanced computer networks
Hisar Terazi	**load cell and electronic balance systems**
Saykon Sayisal Kontrol	production and command systems; programmable controllers
BKS Bilgisayar ve Kontrol Sistemleri	measurement systems for multi-channel physical magnitude
AES Atomium Electronik	**heat shrinkable polyolefin tubes**
UCA	corona therapy equipment; plasma surgical device
Teknofil	surgical laser systems
Enel Elektrik	microprocessor-controlled UPS
Exe Yazilim	pilot plant for production of blue pigment copper
Art Bilgi Islem	hardware and software for university information systems

Note: bold entries are manufacturing, unhighlighted entries are design and development except as noted

Incubators are guided by and responsible to their boards of directors, with counsel provided by advisory groups in some instances (Table 11-10).

Table 11-10: Incubator Organizational Structure

Incubator	Board of Directors	Advisors	Other
MRCT	Executive committee, headed by president of research centre	20 members from industry, finance, higher education	
ITU-KOSGEB, ODTU-KOSGEB	Consultative committee: six members develop policies and principles	Examination and selection committee. Four members perform technical studies to assist in tenant selection, project examination, and make reports to executive board	Executive board, six members w/ chair, centre manager, provides guidance to management

The three operating incubators are State-owned, non-profit organizations, but incubators under development will incorporate as private, for-profit corporations. A variety of specific goals provide the basis for different focuses of each incubator (Table 11-11).

Table 11-11: Incubator Objectives

Incubator	Objectives
MRCT	See below
ITU-KOSGEB, ODTU-KOSGEB	Support technology-based entrepreneurship, especially in information (microelectronics, computers, telecommunications), flexible production and automation, advanced materials, biotechnology and genetic engineering, space and aviation, nuclear energy; respond to requests from industrialists to support university/industry cooperation.
ITAS	Encourage economic development, especially in the Aegean region; stimulate the founding and developing of new businesses employing high technology with higher value-added potential.
ATAP	Promote entrepreneurship in every sector; establish and grow new technology-based firms; use university knowledge to solve industrial problems; increase the variety of regional economic options.

Incubator financial activities are reported on a monthly basis, with quarterly performance reviews commonly provided for incubator administration. Operating reports of the tenants remain confidential from the public, available only to the management of the business, incubator and consultants. The latter, who are assigned to each business in some incubators, often provide general assessments of tenant progress toward graduation. Formal periodic assessments, however, do not appear to be part of the programme at any of the incubators currently in operation.

MRCT. Draws its clients predominantly from existing businesses that set up branches in the incubator to make use of the nearby Marmara Research Centre facilities. The incubator was established to meet this need and thus enhance technology commercialization. It was not designed to support the establishment of new enterprises.

ITAS. The initial plans called for the incubator to serve existing companies with a high technology focus. A broad (86-member) shareholder base is in place to support this mission. Technology transfer and commercialization from the university remain the major goals of the incubator while existing enterprises are the source of entrepreneurs.

ATAP. Both industrial researchers and university graduates are thought to form the pool of potential applicants for space in the incubator. The local chamber of commerce and several industrialists, as shareholders, provide the basis for a referral network.

ODTU-KOSGEB. Graduates of the Middle East Technical University form the basis for the tenant pool, representing 96% of the incubator businesses. While 65% of the tenants are start-up businesses, a number of other entrepreneurs are spin-offs from existing companies.

Each incubator has common bases for entry: technological innovation, economic value and entrepreneurship potential. Businesses without a technological orientation are not permitted. Application is made giving a description of the project, and approval rests on a qualitative evaluation of the applicant's background, financial requirements and personal resources. The written application is accompanied by a personal interview, generally with the incubator manager. ODTU-KOSGEB encourages entrepreneurs to present their business concept to an admissions committee, which assesses applicant technical skills and entrepreneurial talent, potential size of the venture, ability to employ a more qualified labour force, and ability to work with the existing tenant mix.

Prior to entry, incubators and the affiliated universities require an entrepreneur to form a legally registered company to conduct research, development, manufacturing or sales. Without such a company, removal of the enterprise from the incubator, should it fail, would be very difficult.

11.4 Conclusion

The effect of business incubators on the economy is not easy to quantify since reliable data is difficult to find and samples are small. Moreover, a clear weakness is that no concise statement of incubator aims and objectives exists among the Turkish facilities. Full support is needed from the public authorities to sustain the operation of these centres. Unfortunately, political patronage often needs quick and ready results, which are not always available with incubators.

Most of the incubating companies do not have business plans, and do not believe a business plan is the proper tool for their development. Entrepreneurs rationalize this on the basis of uncertainties in the Turkish economy. Without business plans it becomes difficult to evaluate the progress of the tenants. On the other hand, training programmes planning and managing small business operations are the most popular among tenants.

As distinguished from the incubators discussed in other countries in this study, the ITU and ODTU-KOSGEB centres have a second, equally important, mission—to act as a bridge between the university and industry (similar to the Teaching Company Scheme in England). Attempts are being made to formulate new legislation, making it easier for university teachers to establish businesses in Turkey.

Unfortunately, no financial support is available for the tenant companies. Access to venture capital, seed capital, credit guarantees, and some type of revolving credit is needed. Only five of 36 companies are using bank credit. Very high interest rates and guarantees required by banks limit companies' access to bank financing.

Business consultancy services have been deemed inadequate in quantity and in quality. Experts on small business management are not easily found to work with incubator staff. This situation needs to be remedied, as incubation centres are, to date, the only organized system of support in establishing technology-based start-up businesses in Turkey.

11.5 Case Studies

ITU-KOSGEB Technology Development Centre

ITU-KOSGEB Technology Development Centre is situated on the Istanbul Technical University's (ITU) Ayazaga Campus. Two incubator buildings comprise the Centre. The first, built by the contribution of SPO and KOSGEB, has a modular design. The second, a warehouse, is 350 metres from the first building and was renovated by KOSGEB. The first building is 1,150 sq. metres and the second, 1,500 sq. metres. Half of the second building is used by KOSGEB as a training centre.

ITU-KOSGEB has a staff of seven KOSGEB employees: a full-time manager, computer supervisor, financial supervisor, secretary, attendant, driver, and part-time accountant. Managers are appointed by the KOSGEB chairman with the approval of the university rector. The managers are responsible for Centre operations consistent with the decisions of the executive board, and are responsible to the university and KOSGEB for operations. They are empowered to carry out planning, organizing, coordinating and auditing the activities of the Centre.

The companies admitted to the Centre are granted sufficient space for the conduct of their operations. Amenities include telephone connections, basic office fixtures and computers. Tenants are entitled to such office facilities as secretarial services, typing, fax machines, photocopying and word-processing. Meeting rooms and conference halls, as well as exhibition areas, are available for use by all companies in customer relations and promotional activities. Opportunities are also provided for tenants to participate in national and international fairs.

Tenants have access to national and international databases, as well as international cooperation opportunities via the KOSGEB and university information networks, and the university library. The consultancy services used by companies are available through the Technology Development Centre at the university, through KOSGEB units and affiliated specialists.

Workshop and laboratory needs are met by facilities of the university, KOSGEB and other organizations. Facilities provided include access to CAD, CAM and VLSI for advanced design requirements. The companies admitted to the Centre may avail themselves of equipment and materials in keeping with the KOSGEB Entrepreneurial Materials Support Regulations.

The tenant companies' financial obligations for services include:

- Working space: a rental charge per square metre at rates determined by the executive board, according to the Centre's annually scheduled cost increases
- Heating, water, power, maintenance and repair: included in the annual rental charges, with the exception of electricity, which is subject to charge if the company's power consumption rate exceeds 10 kWh

- Office amenities: telephone and fax are charged per use; photocopying and printing are subsidized at rates determined by the Centre
- Consultancy: a participation charge calculated at 10 to 30% of market rates is charged to the companies benefiting from consultancy services
- Promotion and marketing services: participation in national and international exhibitions and fairs is secured through the KOSGEB Guidelines for Supporting Participation to Fairs; 50% of the costs in entering exhibitions is covered by KOSGEB
- Information services: provided by the Centre's management
- Laboratory and workshop services: a participation charge calculated at 10 to 20% of market rates, as determined by the executive board of the Centre
- Laboratory and materials support: tenants are supported under the KOSGEB Entrepreneurial Materials Support Regulations

The ITU-KOSGEB Centre is leased for 15 years, while the ODTU-KOSGEB Centre has a 25-year lease on its facility.

ODTU-KOSGEB Technology Development Centre.

ODTU-KOSGEB Technology Development Centre is located on the Middle East Technical University (ODTU) Campus in Ankara. The 3,250 sq. metre building originally was designed as a research centre by Tübitak in 1992. Conference rooms and an exhibition hall are useful, but the large corridors and small rooms are not optimal for incubator needs.

The staff, employed by KOSGEB, includes: a full-time manager, two senior experts, an accountant, secretary, technician, attendant and driver. The Manager is appointed by the KOSGEB Chairman with the approval of the university rector. Administration, facilities and services are similar to ITU (above).

MRCT-Marmara Research Centre Technopark

MRCT is located in the Tübitak Marmara Research Centre (MRC) in Gebze, 40 km from Istanbul. Tübitak Marmara Research Centre, the biggest facility of its kind in Turkey, started its activities in 1972 on 7.3 square km of land. It consists of 18 research units and two institutes, with a total staff of 835. The objective of MRC is to carry out basic and applied research that contributes to national progress by generating new, commercially applicable technology.

The MRCT has an executive staff of two, a full-time manager and secretary. Staff are employed by Tübitak with similar duties and responsibilities as at ITU and ODTU. Free of additional charge, support includes: secretarial and library services, recreation and sports centre facilities, and public transportation. Fully billed services include telephone, fax, photocopying, lunches and overnight accommodations. The Tübitak contribution is US $100,000.

ATAP-Anadolu Technology Research Park Inc.

The incubator building itself is located at the Anadolu Technical University in Eskisehir. The construction of the facility is complete, but operations have not yet begun. The 1,458 sq. metre building was designed exclusively as an incubator, with the base floor used by university departments and the first and second floors planned for incubator operations. The part-time manager will soon be replaced by a full-time manager. The SPO contribution is US $236.000.

ITAS-Izmir Technopark Inc.

This incubator is situated at the Aegean University Campus in Izmir. The building was designed for incubator use and completed in 1992, but operations have yet to begin. ITAS prepared a new business plan and feasibility study, and may be able to open soon. Although designed as an incubator, rentable space compared to gross space is quite low. The incubator plan calls for a staff of 12 to operate the centre efficiently: a manager, assistant manager, executive secretary, receptionist, a financial manager, an accountant, attendants (2), security personnel (3), and a driver. A manager was appointed in April 1995. He is a recent retiree from one of the largest private companies in Izmir, YASAR Holding. The SPO contribution is US $441,000.

AU-KOSGEB Technology Development Centre

Since Ankara University (AU) is not a campus-based university, the planned incubator will be situated on two storeys of an existing four-storey university building in Ankara. Plans call for KOSGEB to renovate the two floors (570 sq. metres).

KTU-KOSGEB Technology Development Centre

The planned incubator will be situated on the first floor of one of the Karadeniz Technical University's buildings in Trabzon. KOSGEB will renovate a 650 sq. metre section of the building before beginning operations.

BU-KOSGEB Technology Development Centre

Plans are being developed for an arrangement similar to the one with Ankara University (above).

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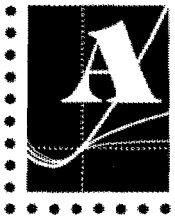

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