TECHNOLOGY BUSINESS INCUBATION

A Toolkit on Innovation in Engineering, Science and Technology

Rustam Lalkaka
Science and Technology for Development series
TECHNOLOGY BUSINESS INCUBATION

A TOOLKIT ON INNOVATION IN ENGINEERING, SCIENCE AND TECHNOLOGY

Rustam Lalkaka
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Better linkages between knowledge production and use are vital for economic and social development. Technological innovation and the diffusion of knowledge play a crucial role in this process. This occurs not only at the level of universities, research institutions and industry in the commercialization of research and development (R & D), but also between knowledge producers and users elsewhere in the public and private sectors, and at the ‘grass roots’ in countries around the world. At the grass roots level in developing countries, for example, technological innovation is important for poverty reduction in such areas as water supply, sanitation, food production and processing, housing, energy and transportation, and promoting job creation and income generation.

The gap between rich and poor countries is usually indicated in economic terms, but reflects more essentially a gap in knowledge production, transmission and application. Indeed, the technology gap is a major factor underlying economic disparities around the world, emphasizing the importance of the development and application of technology and technological infrastructure in economic development. Education and innovation in engineering, science and technology is of paramount importance in narrowing the gap between the developed and developing countries. This has been emphasized at such events as the World Conference on Science in 1999; the World Engineers’ Conventions in 2000 and 2004; the 2001 UNDP Development Report focusing on technology; the 2003 InterAcademy Council Report, ‘Inventing a Better Future’; and, most recently, the 2005 UN Millennium Project Task Force report on ‘Science, Technology and Innovation’.

Narrowing the gap between countries in terms of technology innovation, adoption, diffusion and utilization, particularly for the poorest countries, is therefore a major priority for international agencies and organizations, and particularly for UNESCO (where the ‘S’ stands for science, and includes engineering sciences and technology). The objective of the UNESCO Toolkit Series of information, advocacy and learning/teaching materials on ‘Innovation in Engineering, Science and Technology for Development’ is to address the difficulties often faced by potential innovators relating to the need for greater awareness, information and support for the role of innovation in development.

This Toolkit on Technology Business Incubation presents examples from around the world that provide background business support for ideas and inventions, and the commercialization of R & D, that will be of particular value for the start-up incubator. This Toolkit should be useful for incubator and innovator development around the world. We invite partnership from governments, inter-governmental organizations, NGOs and industry to cooperate with UNESCO in the development of workshops and follow-up activities making use of the material published in this series.

Walter Erdelen
Assistant Director-General for Natural Sciences, UNESCO
The application of science and technology is the main agent of industrial, economic and social development. With increasing globalization and recognition of the importance of the ‘knowledge society’, cooperation between knowledge producers in universities and research centres and knowledge users in industry, the private and public sectors is vital for innovation and the commercialization of R & D in all countries.

Universities, research institutes, industry and government are increasingly aware of the importance of cooperation in science and technology to promote sustainable industrial, economic and social development. This requires education, training, research and advisory services, which universities are able to offer. In many countries, particularly in developing countries, universities and industry both face constraints, and enhanced university-industry cooperation would contribute significantly to economic and social development.

In line with the goals to promote cooperation between universities and industry in the transfer of R & D and engineering education, a current focus of the Engineering Sciences and Technology Programme of the UNESCO Toolkit Series of information, advocacy and learning/teaching materials on ‘Innovation in Engineering, Science and Technology for Development’ is to promote education, training, capacity-building and institutional strengthening in innovation.

The successful application of technology is of crucial importance in business development and relates both to hardware equipment and software operating skills. An increasing number of businesses are founded on and develop from a technology base. Potential innovators are, however, cautious, and there can be a high rate of attrition in technology-based businesses. The number and success of technology-based businesses would increase if innovators received good advice to develop their businesses.

The primary function of a technology business incubator is indeed to provide advice and support to innovators in business establishment and development. This support may relate to technology or business management. In order to address the need for increased awareness and information regarding technology business incubators, the UNESCO Engineering Sciences and Technology Programme has developed this Toolkit. Potential partners from government, and inter-governmental and non-governmental organizations are invited to cooperate and support the development and application of this Toolkit.

The Toolkit is designed as an attractive package of information, with three overlapping functions: to provide general information on, promote awareness of, and provide learning and teaching material on technology business incubators.

The information and awareness-raising function of the Toolkit focuses on introducing the role and importance of technology business incubators. This aspect is directed particularly at planners, policy- and decision-makers and other relevant authorities in government, NGOs and the private sector, and at related national, regional and international organizations. The Toolkits are produced in manual style for an international audience and will be produced in hardcopy and electronically.
The learning/teaching function is the major substantive component of the Toolkit. This introduces, discusses and provides case-study material on technology business incubators for interested parties, teachers and students at later undergraduate and earlier postgraduate level, and for formal and informal continuing professional education. This component also has a particular focus on developing countries.

The publication of this Toolkit will complement the development of training and workshop activities on technology business incubators, the production of case studies and pilot surveys, and the further development of the Toolkit, including translation and application in other languages.

The Toolkit begins with an Introduction and overview by the author. This is followed in Chapter 1 by a discussion of incubation concepts – business venture creation and the design, support, linkages, activities and limitations of technology business incubators. Chapter 2 presents and discusses the planning, legal considerations, and a financial analysis of costs, sources of funds and benefits, of the establishment and operation of an incubator. Chapter 3 discusses the implementation actions that are required to establish an incubator in terms of construction, organization, training, development of a business plan, tenant selection, deselection and marketing. Incubator operating, training, counselling, management, performance assessment, monitoring and enhancement are presented in Chapter 4. Lessons learned are presented in Chapter 5, with a discussion of future trends and new incubator modes, including ICT and virtual incubators, business accelerators and technology clusters, and an associated 'Action Points' box.

UNESCO would particularly like to thank the author – Rustam Lalkaka – and Dinyar Lalkaka, for helping put the Toolkit together. Rustam also deserves credit for his commitment in the somewhat protracted incubation and production of this Toolkit. The idea for this Toolkit developed from a meeting sponsored by UNESCO in Jakarta in 1995, when Rustam was visiting Indonesia to help develop technology business incubators in that country. Rustam is a leading authority on incubators. He told the story in Jakarta of a touring lecturer whose driver said that he had heard the lecture so many times that he could give it himself. The lecturer agreed, and the driver duly gave the lecture, only to encounter a difficult question at the end – to which he responded that the question was so basic that even his driver, standing at the back, could answer. Rustam is also a driver of international interest in incubators and deserves full credit for his contribution to this field.

Tony Marjoram
Basic and Engineering Sciences, UNESCO
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The United Nations Educational, Scientific and Cultural Organization has long recognized the need to develop innovative, cost-effective ways to link the knowledge base of universities and scientific research organizations to the marketplace. The urgency is clear as social and technological innovations, with the potential of tackling intractable economic and business problems, need to be applied at a more rapid pace within nations and across borders in this globalizing economy.

Business development services and service-augmented workspaces (such as business incubators) have evolved rapidly in the last fifteen years. This is due, in part, to the rapid changes in the information and communications technologies (ICT), and in international trade regimes that present new opportunities – and pose enormous challenges – for small- and medium-scale enterprises and for new venture creation. Technology Business Incubators (TBIs) ought to be seen as one support mechanism that can complement other tools in the process of linking knowledge organizations (such as technical universities and research institutes) to the business sector, promoting new enterprise formation and economic development.

**Purposes of the manual**

This manual is intended to guide sponsors, researchers, educators, and corporate and government planners in exploring the incubation option, and then in establishing and operating a successful TBI programme, where warranted. While the body of studies on incubators in general is growing, there are few studies specific to technology incubation in developing country environments. Lessons are being learned and planners can benefit from the mistakes others have made (while making some new ones themselves!).

The manual presents good practices on a range of issues, to be adapted by the sponsors with flexibility to suit their own requirements and conditions. No publication can cover all eventualities or be a substitute for the practical experience of good governing boards and competent managers who have a basic understanding of the art and craft of day-to-day incubator operations. Incubator staff should continuously enhance their skills through hands-on experience, as well as by staying abreast of the literature and participating in associations and conferences.

The manual draws upon the experiences gained by Business & Technology Development Strategies LLC, International Consultants, New York, which has been involved in the planning, establishment and management operations support of venture creation programmes in some forty nations. The manual has also benefited from incubator activities initiated in a dozen developing and restructuring countries by the UN Fund for Science and Technology for Development (UNFSTD), and the United Nations Development Programme (UNDP) office in New York, starting in China in 1987.

**Contents**

The manual covers a progression of incubator development tasks, in five chapters:
1. ‘Incubation Concepts’ places small enterprises and their support services in the overall framework and outlines the characteristics, objectives, types and challenges of business incubation systems (Chapter 1);

2. ‘Planning’ covers the preparations, feasibility analyses and business planning, the selection of location and design of facilities, followed by the financial analyses required and expected benefits (Chapter 2);

3. ‘Implementing’ follows by defining the actions required to establish the TBI. The additional implementation actions are reviewed, such as that of the organizational structure, training of the management team and marketing of the incubator, as well as the criteria and procedure for selection and exit of client companies (Chapter 3);

4. ‘Operating’ details ways of serving client companies through training, counselling and networking. It outlines measures for enhancing financial sustainability and a framework for assessing and monitoring performance, as well as other management practices (Chapter 4);

5. ‘Lessons Learned and Future Trends’ – The lessons learned and emerging trends are reviewed in Chapter 5.

A bibliography and ten annexes are also given.

Using the manual

This guide could be used as a training workbook and as a practical reference to be consulted from time to time for guidance on the establishment and operations of TBI programmes. There is no fixed, prescriptive ‘model’, because an incubator has to be planned to suit local conditions, which will vary widely.

This manual would be of particular interest to those who are not yet fully familiar with incubation concepts, and who are exploring the possibility of starting an incubator, especially in developing countries. It includes examples of how principles described have been applied in different contexts. At the end of each chapter, a box summarizes the possible actions that could be taken. The ten annexes contain checklists, and report pro formas and other details, to help prepare relevant documents based on local needs.

As the incubator programme matures, its planners and management team will undoubtedly modify and add to the materials covered here, on the basis of their own experiences and on their local needs, whether they are government agencies, university officials, private developers, community leaders, or the early-stage businesses themselves.

Acknowledgements

This manual draws on the work of Business & Technology Development Strategies LLC, New York, on venture creation and business incubation in many countries, and in collaboration with colleagues Jack Bishop, Carl Tiedemann, Pier Abetti, Lilia Arechavala, Jack Malan and Hideto Ohtsubo. My special gratitude is to Dinyar Lalkaka, without whose help this manual would not have been possible.

Glossary of terms used

In this manual, the terms are used as follows:

Business incubator: a workspace with support services provided to selected start-up and early-stage ventures, to enable them to develop their product or service for entry into the market. Some have objected that the term ‘incubator’ would seem to imply that the members are somewhat premature, unable to survive unassisted, and therefore in need of special care. (The term is also difficult to translate into some languages, being associated with chickens or hospitals! Yet the name ‘incubator’ has caught on in many countries).

Technology business incubator (TBI): a facility providing nurturing services to selected start-up and entrepreneurial groups in early-stage technology-related ventures, to help them scale-up laboratory research results, or their own innovations, and to develop viable businesses.

Technology or knowledge venture: a venture based on innovations developed in state, university or corporate research laboratories, incrementally at the shop-floor or in the creative minds of people in all walks of life.
Member or client: the early-stage ventures in the incubator.

Graduates: those who leave when they have outgrown the space and services that the incubator offers.

Terminating companies: companies who leave because they may fail to achieve their purpose, merge with others, or have to exit for other reasons.

Affiliates: companies who work in their own premises and are served by the incubator on an outreach basis.

Anchor tenants: established organizations admitted to provide credibility and mentoring, while paying higher rents and not being required to leave the incubator.

Champion: a champion is the person who believes fervently in a concept (such as incubation) and is willing to spend his energy and political capital in bringing this to fruition. The champion is the mover and shaker who makes it happen. A successful incubator invariably has such a person behind it.

Overview

Nurturing technology ventures under conditions of global change

Small businesses create the bulk of new jobs in all countries, but they have high failure rates in the early years. The imperative today is to provide targeted support to start and grow new ventures for creating employment in the face of globalization, rapid technological change, economic uncertainties, and more-open markets. For these reasons, the number of business incubators has expanded rapidly to about 4,500 worldwide (2005), and growth is now faster in developing and restructuring countries than in developed countries.

While the incubation concept appears simple, it is difficult to apply where entrepreneurship has been repressed and business infrastructure is inadequate. Depending on the local conditions and goals of the sponsors, incubators are designed to promote technological innovation, industrial subcontracting, regional development, empowerment of disadvantaged communities and other objectives. Although they can serve a variety of businesses, some are focused on technology, broadly defined. Since entrepreneurs and start-up ventures in advanced fields (such as new materials and biotechnology) may encounter severe problems in pursuing their innovations and mobilizing the needed technical, financial, and human resources, the TBI facilities and services that support them have to be tailored to their special needs.

The main incubation characteristics are: the careful selection of entrepreneurial firms; focused counselling, training, mentoring and networking on management, marketing and information; and an affordable workspace with common office facilities, in one integrated package. The support comes from a small trained management team, under the overall guidance of a local Board of Directors, supplemented by access to outside service providers. Another characteristic is that client-companies should ‘graduate’ (that is, move out of the incubator) when they are successful and when their needs outgrow the incubator’s capacity. Those not likely to succeed should also be enabled to leave. A distinction should be made – substantive, and not just semantic – between incubation (the process for the nurturing of early-stage ventures towards success) and the incubator (the facility that provides the workspace).

Supportive state policies, investments in education and research, and good technical infrastructure are the prime responsibilities of governments. While part of the initial financing for venture creation will come from the entrepreneur, family and friends, the debt and equity capital has to come from a financial system geared to these requirements.

The affiliation of the TBI to a knowledge-base such as a technical university or a research institute facilitates access to expertise and equipment. However, the cultures of academia and business are quite different, and both have to adjust to each other’s aspirations and work patterns. The linkage to a technology park and the involvement of private business persons as mentors, investors and buyers in the supply-chain can be very helpful.

A carefully designed and operated TBI has the potential of significant benefits: for the entrepreneur, in terms of improving the chances of the success of his or her undertaking, and for the university, in enhancing its linkage to business as well as providing learning and
income opportunities for both faculty and students. It can also serve the business sector by outsourcing products and services and investing in innovations provide the state and the community with jobs, incomes and exports; and assist in the nation’s transformation towards a knowledge society.

The key initial step is a dialogue among the stakeholders on the various options for venture creation, based on the macroeconomic framework and on an understanding of the merits and demerits of the available options. This should indicate whether an incubation system is a good model to be further explored. The next step is the preparation of a feasibility analysis of the market conditions and of the real needs of entrepreneurs and potential ‘incubatees’. Then, if warranted, a business plan should be prepared by a local team, supplemented by external expertise if needed. This manual helps guide the preparatory process, comprising the identification of sponsors and objectives, the selection of a location, the construction (or renovation) design of the TBI building, and the development of consensus among all stakeholders.

A critical component is the financial analysis, which estimates the investment and working capital to be mobilized, and the revenues expected, and indicates the prospect of sustainability. In both industrial and developing countries, the initial financing is usually provided by city, state or federal government agencies, and by affiliated institutions such as universities. The goal, however, is to raise incubator income through services, facilitation, space rentals and other sources, in order to cover expenses when the operations have stabilized in, say, five years.

**Transformation of the incubation system**

Significant changes have taken place in the last five years or so in the concepts and practice of incubation. As this industry grows, it comes in for closer scrutiny. Some of the changes underway are summarized below:

- **Incubators in developing countries**: In comparison to the industrial countries, incubators arrived late in developing countries, representing less than 40% of the incubators worldwide in the year 2000. However, their numbers have grown. Today incubators in developing countries account for roughly half the world total, and these numbers are still rising.

- **Sources of incubator experience**: Whereas, in the past, developing countries acquired their incubator planning and operating practices from the developed world – by participating in conferences of the National Business Incubation Association (NBIA), of the UK Business Incubation (UKBI) and of other organizations – they now have their own associations and are developing operations by adapting good practices abroad to suit their own cultures and conditions.

- **Dominant purposes**: Incubators in the industrial countries serve a variety of objectives, including regional development and empowerment – with a small proportion (under one-third) acting as technology incubators. But most of the incubators in developing countries (90% and over) have been focused on technology commercialization and technology-based ventures, loosely defined. This is now changing, however, and developing countries are also moving to mixed-use incubators, incubators for women entrepreneurs, and other non-technological purposes.

- **IT incubator bubble**: Around the year 2000, there was a sharp growth in internet-related incubators, followed by a sudden decline. Some lessons were learned. Some practices are being modified to suit the reality, including incubators taking equity in client ventures through a seed venture capital facility and a closer involvement of management consultant services.

- **Concern about performance**: As incubation has matured, it has attracted closer scrutiny and criticism regarding its claims. There is growing concern that the performance of many incubators needs to be enhanced through better services, rigorous monitoring and evaluation. The facility that essentially provides cheap workspace without the nurturing, networking and facilitation support, can no longer claim to be a successful incubator.

- **Subsidy or social investment?**: A large proportion of incubators receive considerable external support, typi-
cally 30%–40% of operation expenses. As incubators provide returns to the exchequer through jobs, income and taxes, together with other benefits, public investment could well be considered as an investment in the social infrastructure, providing a challenge to incubator management teams and not as a complacency. It is now widely accepted that, while initial state support for public-private incubators is needed, the objective should be to reach higher levels of financial sustainability.

- *Accreditation:* There is now serious interest in developing systems for accrediting incubators as well as incubator managers. Issues being debated include: What are the salient criteria for good performance? Are these universal, or essentially dependent on local context and conditions? Who is better qualified to undertake such accreditation – governments or incubator associations?

The above trends are reflected in this manual.

### Determinants of successful incubation

The prerequisites for an incubation programme and the determinants of success in its implementation are summarized below. An overview of the progress in selected countries is given in Annex 1.

#### Prerequisite factors

- *Focus the energy and resources of the TBI on developing the enterprises within it, utilizing networks of government, university and community support:* New jobs and economic growth are created typically by the entrepreneur after graduation from the incubator. In some countries, the tendency is to spend much effort on preparing perfect plans, rather than on implementing actions or providing real services for enhancing performance. Further, small enterprises and the affiliates outside the incubator can learn from each other.

- *Manage the TBI as a businesslike and demand-led enterprise, which progressively recovers significant proportions of its operating costs:* The managers of services for entrepreneurs have to be entrepreneurial themselves. They should network with local professionals in creative ways and mentor the client businesses. At the start, government involvement is necessary to create the business infrastructure and to provide initial funding for incubator establishment. But corporate sponsors, regional and city agencies, universities, research institutes and associations should get involved to help improve performance and move towards sustainability. At the same time, innovative ways of generating revenues need to be initiated, such as a possible in-house seed capital fund and a future expansion to a technology park.

- *The incubation services and structures offered must be based on the local context and be compatible with existing support programmes:* The development landscape is littered with remnants of programmes that had limited outcomes and were not sustainable. They did not build on the knowledge and needs of the target clients, and on the involvement by sponsors. Good practices have to be identified and adapted.

- *An outward-looking incubator service is forced by the competition to become more dynamic, more efficient:* In the face of global outsourcing, the skills and structures for enhancing productivity and marketing are the most critical. If what you can do can be done by anyone, there will always be someone willing to do it for less. Liberalizing markets require continuous innovation in an environment that encourages risk-taking and the questioning of conventional wisdom.

In many countries, TBIs have reached a level of maturity and can benefit from linkages between incubator associations and clients, within and among countries. Incubator associations have to play catalytic roles, together with international organizations such as the United Nations system, donor agencies and development banks.

### Good practices for adaptation

- *Develop consensus among sponsors on the defining principles of business incubation as the strategic model to be explored – that is, on just what they mean by ‘business incubation’:* In order to avoid misunderstandings and conflicts, core concepts must be clearly explained to all stakeholders and commitments obtained at the outset, especially for ‘patient money’ in the initial years.

- *Prepare feasibility analyses, and the business plan if warranted, to honestly assess all key issues and decide whether*
the incubator is going to be effective and sustainable: In many countries, such analysis is incomplete (or information is biased in order to ‘sell’ the project and to obtain funds). With consensus in – and ownership by – the community, the incubator has a good chance of becoming financially sustainable. This also requires careful scrutiny of facilities and costs, the delegation and accountability of authority to managers, and major efforts to mobilize government and private sector support.

- **Recruit, train and properly remunerate a competent TBI management team, capable of and accountable for, providing practical help to enable the companies to grow:** The staff must be local, with an understanding of the specific needs of the companies and of the regional support network. Initially, for special tasks, external experts could be helpful.

- **Choose a location and building that will enable the incubator to generate sufficient revenues and that will support business incubation:** The building should be of high quality, conveniently located and well equipped (with telephone exchange, computers, copiers, faxes, e-infrastructure) in order to attract creative companies. Mistakes in selecting the most suitable location, and design of facilities tailored to the target companies, are expensive.

- **Select companies that have the potential to grow and to create jobs:** The incubator manager must resist political pressure to recruit companies that do not meet criteria. The entrepreneurs’ business plans, as well as their commitment, management and marketing competencies, should be rigorously evaluated. A business/technical advisory group can advise the manager in making sound selections, subject to endorsement by the Board.

- **Mobilize the funds required for the incubator and its clients:** When the investment and working capital are not secured from the start, the incubator management team has to spend much of its time finding funds – time which could be better spent on serving client companies. The incubator must provide information, help prepare business plans and assist its clients in accessing initial seed funds from external or in-house sources.

- **Customize the delivery of services and address the development needs of each company:** The clients will have varied needs and high expectations, particularly in the area of advice on markets and finance. The management team can be developed to provide some services in-house, supplemented by access to networks of mentors and professionals in the community. This is especially important under conditions of global economic and technological change.

- **Continuously evaluate and improve services as the incubator progresses and its needs change:** Careful monitoring of progress should be done monthly by the incubator management team and Board, so that deviations from the original plan are promptly identified and corrected. For the purposes of assessing performance, quantifiable measures have to be set, data collected continuously, and frank reviews undertaken.

- **Do not underestimate the forces of culture, history and geography:** These can help or hinder the venture creation process.
Venture creation in the global context

The role of business incubation has to be examined in the overall framework of small enterprise creation mechanisms and business development services under conditions of change. A salient feature of globalization is the extension of the international division of labour to specialization in different goods and services of the production chain across regions. Corporations now operate through functionally integrated and geographically dispersed activities; out-sourcing of business services, high-end scientific research, and medical and legal tasks, enable them to optimize competitive advantage by mobilizing professional and manufacturing factors, where available, at significantly lower costs.

This, in turn, offers expanding opportunities for modern small enterprises that can anticipate and organize for change. It is also a challenge for planners, educators, research managers, and social entrepreneurs, to restructure the knowledge systems and better equip their community and its innovators to respond to the reality of the new marketplace.

Nurturing business enterprises

In both industrial and developing countries – with the exception of the former Socialist countries – micro-, small- and medium-scale enterprises (those employing up to say 500 persons) have generally constituted the overwhelming bulk of total firms by number, contributing around one-third to one-half of gross national product, and total non-farm employment. Entrepreneurial small companies with growth-oriented management can adapt faster to change, create new products and bring them to market swiftly, trim overheads, and supply the large corporations with low-cost and high-value services and goods.

Promoting growth-potential enterprises

Governments of industrial countries have intervened legislatively to provide better access by small enterprises to financing, technical and business services, and fiscal incentives and markets. But, in many countries, the small firms have generally lacked the capabilities to grow and compete, due to a variety of internal and external constraints. Most emerging countries are characterized by a poor technical infrastructure, together with large agricultural and rural populations. Government-sponsored support services for the non-farm sector have generally lacked the needed flexibility, motivated personnel and political leadership. In many instances, national small-enterprise development strategies do not exist, state policies are unfriendly, and regulations are burdensome.1

Further, international technical assistance projects and development loans have often been unsuccessful in leaving behind sustainable activities. Universities, research organizations, large corporations and their associations in these countries, have hitherto played no significant supporting role.

In the former Socialist countries, the emphasis was on giant conglomerates to the neglect of small businesses. For

1. The recent World Bank study ‘Doing Business in 2005’ points out that businesses in poor countries have to overcome twice as many bureaucratic procedures and three times the administrative costs as their counterparts in rich countries.
instance, formerly in East Germany, the percentage of total employment in firms with under 500 employees was only 12%, whereas in West Germany it was over 70% – with vastly different national wealth-creation rates. Indeed, this neglect of self-owned small enterprise based on market signals may be considered a contributing factor to the sudden collapse of the command economies. Today, changes are taking place very rapidly, in Central and Eastern Europe, in China, and in Central and South-East Asia.

Given the need to reduce government expenditure budgets, to privatize the state-owned enterprises, and to generate the 1 billion new jobs needed worldwide, the creation of modern, entrepreneurial ventures can play a crucial role. At the same time, the micro-enterprises – many in the informal sector – have a major role to play in utilizing local materials and skills to produce affordable products for community and regional markets. Their performance can be improved and the returns to labour augmented. The large, the small and the micro-businesses, can develop side by side, in a symbiotic manner. All are needed in their special contexts. New modes of virtual e-incubation, based on distance counselling and learning, await development.

The role of entrepreneurs

The business incubation process is primarily concerned with nurturing start-up and early-stage ventures; these begin with, say, two or three persons, but have a strong growth potential – companies that could become large in the future but happen to be small today. Regarding internet entrepreneurs who made fortunes in the late 1990s in Silicon Valley, Scott McNealy, chief executive of Sun Microsystems, wrote:

As for the start-ups, the ones that will make it will be those that create goods and services that people want and are actually adding value to people's lives. In other words, those that make a profit. … If you don't create value, you have a virtual company with virtual profits. A virtual competitor can easily blow you out of the water just as easily as you created your virtual value (New York Times, 5 July 1999).

This indeed came to pass.

Innovation is the process of envisioning and moving new and improved ways of doing things towards creating value for a business or consumer. In this globalizing environment, innovation and entrepreneurship are the driving forces that move an innovative concept – social or technological – towards enhanced productivity and competitiveness, and on to economic growth.

The starting force, then, is the entrepreneur, operating in a national and international environment, moving to overcome obstacles to create a successful knowledge-based business (see Figure 1). As the agent of change and progress, the entrepreneur identifies a market opportunity and matches this with social or technical innovations in the form of products or services, then proceeds to prepare a strategic plan, to mobilize resources, and drive the business concept to realization. This trajectory – from concept to competitive markets – operates within a political vision and policy framework, underpinned by a business development support system.

The popular conception is that entrepreneurs are born, not made. In fact, present experience indicates that entrepreneurial skills can in fact be identified and developed. The entrepreneur is typically an innovator who formulates better solutions to existing problems and stimulates others to participate in the venture. These aptitudes develop over time, often starting in childhood, as the person faces new challenges and learns from failure.

Sources of entrepreneurs for knowledge-based ventures are often the university and public research laboratories, the large industrial and military establishments, and professional service firms. But innovations – incremental and disruptive – do emerge from a variety of situations. Stimulants to become an entrepreneur include the need to be independent, to create value, to contribute to society, to earn recognition, to become rich or, quite often, to not be unemployed.

Why do entrepreneurship and innovation matter? According to the UK Government:

Entrepreneurship and innovation are central to the creative process and to promoting growth, increasing productivity and increasing jobs. Entrepreneurs sense opportunities and take risks in the face of uncertainty to open new markets, design products and develop innovative processes. (Our Competitive Future: Building the knowledge driven economy, UK White Paper, 1998).

The pace of technical change

Breakthroughs in biotechnology, medicine, computing, nanotechnology, robotics and space, are taking place at a rapid pace. As the nineteenth century ushered in the
telephone, electricity, and the automobile, the twentieth century brought us near-costless and ubiquitous information flows, as well as the decoding and cloning of complex organisms. Our knowledge of inner and outer space is changing our understanding of the universe and our place in it. Computing and communications have the potential to help developing countries in many fields; but more active measures are needed to narrow the gap between the knowledge haves and have-nots, within and between countries, and to transform the digital divide to a digital dividend.

A dozen Newly Industrializing Countries now have the technical infrastructure and capacity for major innovation; for many others, the advanced technologies – adapted, applied and absorbed – can improve their lives. Some countries, however, need to strengthen their technical and educational systems in order to leap-frog into the ICT and bio-sciences environment.

How long will it take for the internet and the web to become big forces in the developing world? According to Dr Michael Dertouzos, director of the Laboratory for Computer Science at the Massachusetts Institute of Technology (MIT):

Bill [Gates, of Microsoft] sees this expanding world of networking as an opportunity for poor people to sell their wares, get educated, participate in the world marketplace and pull themselves up from poverty. I see the exact same thing with a time scale of fifteen years – and only if we help. (New York Times, 6 July 1999).

That is, it would take half a generation, but it has been much faster.

In the rush of ‘technopreneurs’ to start an internet venture, to secure venture capital, and to make a fortune through a public stock offering, many failed, due to unreasonable expectations and a disregard for the fundamental laws of the stock market. Many technology incubators worldwide have large numbers of software and media companies, which are being facilitated by incubation. But this only touches the fringe of the venture creation phenomenon, and surely the vast majority of ventures are started without the intervention of incubators.

Figure 1: Enterprise support system
Key constraints

The tasks to be handled by a business enterprise become more sophisticated, and its need for support increases, as it moves forward from innovative concept to commercialization. Some key constraints encountered are as follows:

Entrepreneurship: An entrepreneurial culture lies dormant in many societies. Here, a distinction may be drawn between the successful proprietor of a small family business (the typical small to medium-sized enterprise, or ‘SME’), and the innovator-entrepreneur who can bring together various resources to develop an enterprise of significant scale. Such firms can best be grown in cultures that support risk-taking and attendant failure.

Indeed, a characteristic of a market economy is allowing failures to happen, rather than sustaining enterprises artificially, as in other systems. The market economy encourages the teamwork necessary to expand, and focus firmly on future potential. To the extent that the secrecy and distrust inherent in closed systems and the lack of concern with competitiveness and quality exist, the blooming of entrepreneurial talent will be constrained.

It is also worth noting that, in the USA – the stronghold of immigrant entrepreneurs – 80% of all millionaires are first-generation immigrants. At a given time, three million people are starting their own businesses, more than are getting married and more than are having children! It is not surprising that nationals of developing country, who learn to overcome bureaucratic obstacles at home, flourish as immigrant entrepreneurs abroad, when cultural constraints are removed.

Financing: A critical constraint is access to the short-term working capital and medium-term investment. The costs of money are often very high, with high interest and collateral requirements. The traditional banking system is usually unwilling to incur the costs and risks of credit to small businesses with no collateral, or is unable to appraise the complex business plans of a technological venture. Risk financing through angel networks (groups of wealthy individuals who make high-risk investments in early-stage companies), or venture capital, is practically unavailable in many developing nations.

Bureaucracy: There are often pervasive regulatory and legal hurdles, interpreted by an entrenched bureaucratic system, which result in delays and much unnecessary expenditure. Problems are compounded by the slow decision-making process, high tax rates, restrictive import/export regimes, currency exchange restrictions, environmental regulations and corruption.

Property rights and related legislation: these are poorly defined in some countries. So, while buildings are vacant, it is very difficult to get possession for starting businesses due to the uncertain legal basis for ownership of land and buildings.

Technology enterprise promotion strategy: State interventions to control SMEs are plentiful, but there are seldom explicit national policies to promote them, or adequate policy instruments to provide effective support, incentives and markets. Small enterprises, with their limited financial and human resources, often cannot access the management skills, trade information and technologies appropriate to their needs.

Enterprise management and marketing: Businesses of any scale require a variety of skills to compete effectively in today’s fast-changing, more open markets. The limited size of the market in small nations and limited purchasing capacity present serious problems. Competition may come from subsidized state companies and from international multinational corporations. In such situations, managers themselves have to adopt decentralized, ‘guerrilla’ tactics.

Such managerial skills begin with the ability to identify feasible projects and access information, to prepare fundable business plans, and to acquire the appropriate technologies, and they continue through the range of functions, from financing and production to marketing.

Business infrastructure and support services: The absence of a strong service-sector of professionals (accountants, attorneys and consultants), and of basic telecommunications facilities, hampers business growth. While many entrepreneurs do start by using only their own capabilities, others can be facilitated by services offering counselling, training and marketing.

Other constraints include the poor understanding of intellectual property issues, the lack of market data, and inadequate accounting, marketing and distribution systems.
Stages of business development

The mix of services needed changes as the entrepreneur plans and starts a business, struggles to succeed, begins to manufacture and market products, and then follows a trajectory of growth (or of decline). The process and place of business may change, together with the financing sources. A tiny proportion of these ventures should grow exponentially; the bulk will grow slowly; and many will fail.

Following a biological analogy, a venture progresses from:

a) an idea (conception), to
b) early-stage (embryo), to
c) a physical product (child), to
d) the learning and testing (adolescent), to
e) entry to market (adult).

Continuing this progression, the business will disappear unless it is reinvigorated with fresh ideas and a new product line. Over the progression in the venture development process, the required services change, typically as follows:

f) information, entrepreneurship training
g) research, costing, prototyping
h) market analyses, process and equipment selection
i) business management, financial planning
j) mobilizing the investment and working capital
k) personnel recruitment
l) marketing, protecting intellectual property
m) production engineering, factory planning
n) competitiveness, quality assurance
o) interactions with foreign buyers.

As the product development cycle moves from concept to full-scale production, the level of skills needed, and the capital requirements, increase significantly. The focus of the enterprise shifts from planning and surviving to managing, and then to managing managers. As it makes the transition from the ‘first crisis of leadership’ to the ‘second crisis of autonomy’, its chief executive officer has to change from the role of promoter to entrepreneurial manager, and to enlist the needed skills.

The incubator’s contribution consists in reducing the gestation time and costs at the cusp, before the business transits from negative to positive cash flow.

If the venture progresses from start-up through its early stages to growth and maturity, its staff increases and sales rise. When, and if, it crosses the threshold of, say, fifty employees and commensurate annual turnover, it becomes a ‘modern’ medium-sized undertaking. Its chances of surviving the crisis of exponential expansion (top curve) are better if growth is evolutionary (middle curve). And some ‘lifestyle businesses’ may prefer to grow more slowly, or not at all (lower curve).

Business development services

The rapid progress in computing and communications, together with more liberal trade regimes, are forcing large companies to become leaner through enhanced productivity, outsourcing and mergers, while requiring small companies to mimic the large through strategic alliances and electronic commerce.

But the new technologies do not necessarily make it easier for small businesses to survive and succeed. Indeed, the causes of failure (poor planning, under-capitalization, inadequate management and marketing skills, inattention to quality and service, low firm-level productivity) are increasing. For governments and donor agencies, the continuing challenge is to develop innovative and cost-effective support systems. There is continuing debate – and emerging consensus – that different kinds of business development services (BDS) for SMEs require varying levels of state support at the initial stages, in rich and poor countries.

Changing approaches to supporting small businesses

Incubation has evolved over time, developing from the experiences of earlier small business support systems, and now attempts to link affordable workspace to focused counselling, training and information, as well as to external networks, university capabilities and financial resources.

In countries transiting from the legacy of a command economy to a more open market economy, the process of structural reform is less than ten years old, and is quite painful. New forms of support for self-owned venture creation are helping to leverage more supportive policies, while reducing gestation periods and costs.

Culture provides a strong bias towards some types of business practices (such as industrial clustering) and support services (such as vouchers). The earlier dominance of government-established small-enterprise support centres is giving way to public–private partnerships such as Enterprise Africa and SEBRAE in Brazil, and to the fuller involvement of banks, as with the Small Industry Development Bank in India.
BDS mechanisms in industrializing countries are under pressure to become financially self-supporting, as governments (and donors) have diminishing resources. In the better-endowed OECD countries, SMEs do receive significant state support. For instance, in the USA, the Small Business Development Centers and the Small Business Innovation Research programmes are government funded.

There is less debate today on defining micro, small and large firms by investment levels or the number of employees, with the realization that the survivalist, the bold and the bountiful all have roles and must work in synergy. The informal businesses now have enthusiastic support from micro-credit agencies for creating livelihoods, while the mega-corporations have the resources to find their own salvation. This leaves the small enterprises in the ‘hollow middle’. The service providers need to target the small ‘modern’ enterprises that have the entrepreneurial energy to grow in sales at rates of 20%–40% a year, after maturity.

Recent experience confirms that enterprise support services should be market-led and businesslike; donors and governments should support the development of the market for services (not the service providers) and should empower the customers to choose the preferred, accredited provider; then, the service selected should be proactively evaluated and monitored, based on agreed measures and methodologies.

**Evolution of the incubation process**

Business incubation has evolved in the last thirty years, developing from early experiences with industrial estates and small enterprise service centres. The first-generation incubators in the 1980s were essentially offering affordable space and shared facilities to selected entrepreneurial groups. In the 1990s, the need was recognized for supplementing space with counselling, skills enhancement and networking, in order to access professional support and seed capital for clients within the facility and external affiliates. The special needs of technology-based ventures led to the second-generation ‘Innovation Centre’. Starting in 1998, a new incubation model emerged in parallel to the first, which was intended to mobilize ICT and to provide a convergence of support towards rapidly creating growth-potential, technology-based ventures. However, these dot-com incubators declined sharply, together with the global economy. What has now developed is a third-generation International Enterprise Centre, which looks outwards towards the opportunities of the globalizing economy.

As noted above, business incubators are growing rapidly, estimated at over 4,000 worldwide (2004; see Figure 2). Such estimates are approximations, as the definitions of what constitutes an ‘incubator’ vary and the numbers rise from month to month. Furthermore, countries tend to inflate numbers and to include planned facilities. *What we need now is better incubation, not just more incubators.*

Of the world total number, roughly one-half are in the USA and the other industrial countries in Europe, Australia, Japan and Canada. It is estimated that, currently (2004), the number of incubators in developing and restructuring nations is roughly the same as that in industrialized countries – and growing at a faster rate. Each group can benefit by exchanging experiences of good (better, or best) practices as well as of failures. Among the industrializing nations, just four – China, the Republic of Korea, Brazil and Taiwan – account for half the total number of incubators in developing and restructuring nations. The challenge, now, is to actively promote and adapt the incubation modality to the conditions in Africa, South and Central Asia, the Middle East and Latin America.

There is some overlapping in the objectives and functions of business incubators (as defined above), innovation centres (which provide focused services to technology ventures, with or without workspace), business support centres (which provide a range of in situ business development services, but without the possibility of groups working under the same roof).

**Characteristics and goals**

In simple terms, the traditional business incubation centre (BIC) is a micro-environment with a small management team that provides physical workspace, shared office facilities, and professional services in one affordable package. Incubators vary widely in their sponsors (state, economic development group, university, business, venture capital), objectives (from empowerment to technology commercialization), location (urban, suburban, rural and international), sectoral focus (technology and mixed, now including kitchen and arts incubators) and business model (not-for-profit or for-profit). In developing countries, the main focus has been on technology incubators for commercializing innovations.

The predilections of leading sponsor(s) influence incubation goals. For instance, a technical university would like to promote innovation and faculty/graduate student involvement, while a research institute seeks the commercialization
of its work. A public–private partnership needs to generate employment and support other social goods, and a private sector initiative aims for profit, patents, spin-offs, equity in clients and enhancing its image. Multiple sponsors bring a variety of concerns and strengths (and conflicting goals). All hope to benefit from the image of a successful programme, and in turn to bring credibility to the incubator clients.

Being a start-up business serving start-ups, the incubator must mimic the dynamism of entrepreneurial ventures, with the prospect of becoming self-reliant in, say, five years of operations. However, the majority of incubators in both developed and developing countries, operate on a non-profit basis and with economic development goals, deriving their incomes mainly from rentals and, for some, from services, supplemented by subsidies (referred to euphemistically as ‘infrastructure investment’ or ‘venture socialism’).

In preparing to consider the development of a business incubator, the essential initial step is to secure consensus among potential sponsors on its mission and main objectives. Then the feasibility study process must assess the possible sources of entrepreneurs and innovations, as well as their stated (and real) needs for support services and facilities from the incubator.

That being said, each incubator is different from another, and characteristics may vary in degree of pertinence. Importantly, all incubators – traditional and technology-based – should concentrate on providing the software of value-adding counselling and services, as well as the hardware of affordable workspace and shared office facilities.

Where the market failures are in the access to affordable workspace and support services, the convergence provided in an incubator could be the preferred system. One might then say, paraphrasing Winston Churchill, that incubation is the worst form of business development service, with the exception of all the alternatives!

**Incubator benefits**

Benefits of a well-managed incubator can be manifold for different stakeholders:

- For **clients**, the incubator enhances the chances of success, raises credibility, helps improve skills, creates synergy among client–firms, and facilitates access to external experts and facilities, mentors, information and seed capital.
- For **governments**, it helps overcome market failures; promotes regional development; generates jobs (especially after the client ‘graduates’ from the incubator), incomes and taxes; and can demonstrate a political commitment to small businesses.

Figure 2: Incubators have grown rapidly

There are now more incubators in developing and newly industrialized countries than in developed ones – although growth is concentrated in China, Korea and Brazil.
• For research institutes and universities, it strengthens interactions, promotes research commercialization, and gives opportunities for faculty and graduate students to better utilize their capabilities and partially-used facilities, while enhancing their image in the community.

• For business, it develops opportunities for acquiring innovations, supplies chain management and spin-offs, and helps them meet their social responsibilities.

• For the local community, it creates self-esteem and entrepreneurial culture, as well as jobs, as the majority of graduating businesses stay within the area.

• For the international community, it generates opportunities of trade and technology transfer between client companies and their host incubators, a better understanding of business culture, and facilitated exchanges of experience through associations and alliances.

These desired outcomes are often not achieved, due to poor management and other factors. Emerging evidence, nevertheless, suggests that in many situations the benefits indicated above are realizable and outweigh the net public subsidy.

Often the start-up entrepreneurs’ task may be to create jobs for themselves and conserve their limited funds. It should be noted that incubators do not directly create jobs; they nurture entrepreneurs who create enterprises, of which some would – after leaving the incubator – generate direct and indirect employment with incomes, assets and taxes. These in turn contribute to sustainable economic growth.

BOX 1: ACTION POINTS

The creation of knowledge-based enterprises gives some industrializing countries an opportunity to participate in globalization. However, for many countries that do not yet have the structures and skills needed for competitive performance, there are enormous challenges in overcoming the obstacles to starting and growing a business. Towards meeting these challenges:

• Business and civil society need to push for supportive state legislation and non-bureaucratic regulations. Further, to establish effective small-business development services that are businesslike, start with the needs of small ventures, designed for effectiveness, impact, outreach to large numbers, and progressive self-sustainability.

• Technological entrepreneurship and innovation do not just happen. They have to be nurtured through major investments in technical education and research, supportive polices and legislation, and basic business infrastructure (continuous electric power supply, reliable low-cost telephone and e-connectivity, etc.).

• The corporate sector has primary responsibilities for careful acquisition, adaptation, improvement and development of technologies for products, services and processes. This is where jobs, income and wealth are created. With this, however, goes corporate social responsibility.

• Public–private partnerships, with strong linkages to academia, are an appropriate means of achieving competitive advantage, raising quality, lowering costs and reaching outwards to international markets.

• Business incubation is one option in the toolkit of venture support services, to be explored for its utility and value in a specific environment. With the full understanding of potential benefits, and the downside, careful preparations and implementation, incubators could complement other initiatives towards entrepreneurial growth.

• The critical tasks for the government are to formulate supportive policies and regulations, to develop the business and knowledge infrastructure, and to facilitate the mechanisms for access to the financing needed by early-stage ventures.

• Political stability, good governance, and economic reform, are the prerequisites. So, also, are honesty and transparency in government.

Countries now called ‘developing’, but which at one time were at the forefront of technological innovation, have to radically rethink their strategic plans, develop the skills needed and build new structures, if they are to survive and thrive under conditions of globalization.
Technology business incubation

Among the approaches being used to foster small enterprises (which are almost always in the private sector), the **business incubation modality** is now expanding rapidly and giving good results. It evolved from the earlier business services, and provides a platform for the convergence of development support (see Figure 3). In the relatively advanced countries, the focus is shifting progressively towards developing commercial applications of value-adding products and services in frontier fields such as biotechnology, information technology, advanced materials and robotics.

**Essential design characteristics**

Technopreneurs everywhere have the challenge of moving a concept through the prototype and production phase, to meet market needs at a price consistent with the value created and with the ability of customers to pay. In the new-technology arena, the market itself may have to be developed and sustained. It is not enough to be first with a better product if one does not have the skills to reach and educate potential buyers.

Technology-based enterprises

Definitions of ‘high-technology’ industry or enterprise have been based on indicators, such as R & D expenditures of, say, 5%+ of annual sales, or a high proportion of Ph.D.s in the workforce. But these are not very relevant today, when innovations spring from creative minds, and college drop-outs become multimillionaires. A more ‘user-friendly’ and more encompassing term is the *knowledge society*, which is based on ethical values and the welfare of humanity. When relating specifically to a product or process, a *technology-based enterprise* is considered appropriate usage.

Such technology-based enterprises have unique characteristics that require special attention:

- Being knowledge-intensive, they are often linked to technical universities and research complexes, with access to faculty, graduate students, scientific facilities, technical information and a creative ambiance;
- Proprietary know-how imposes the necessity of discipline and protection, requiring an understanding of intellectual property rights (IPR) issues, legislation and compliance;

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**Figure 3: Evolution of the incubator model**

[Diagram showing the evolution of business incubation models from the 1970s to the early 2000s, including managed workspaces, enterprise agencies, industrial estates, business centres, science parks, multi-purpose incubators, sectoral incubators, non-tech incubators, technology incubators, empowerment incubators, arts incubators, new economy incubators, corporate incubators, and women’s incubators. Source: Adapted from the Centre for Strategy & Evaluation Services, Sevenoaks, United Kingdom]
The technology business incubator (TBI)

The TBI, a variant of the business incubator, has the purpose of enterprise creation focused on technology-based ventures, broadly defined. Essentially, the TBI is an environment with a small management staff that provides the physical space, shared facilities, counselling, training and information specific to selected technology ventures, with access to university research, financial resources and technical support services, in one integrated and affordable package.

Such ‘caring and sharing’ have been shown to facilitate business start-ups by reducing initial costs and delays, and to diminish the chances of failure at a fledgling enterprise.

Most incubators in the developing countries of Asia and Latin America have a technology focus. On the other hand, in advanced nations, less than one-third are for technology ventures, and mixed-client incubators predominate.

Incubators, in general, present seeming contradictions:

• The incubator has elements of public good and private gain.
• The management team serves external clients and may ‘crowd out’ external services.
• Clients within a facility may compete and also benefit by cooperation, but, when they become successful and comfortable, they are required to leave.
• Initial state support is essential, but state intervention is to be avoided.

The main features of a TBI include the careful selection of prospective entrepreneur-clients; assistance in preparing business plans and accessing seed capital; training in small business management skills; and, after a reasonable incubation period, the ‘graduation’ of successful businesses from the incubator, making space available for new clients. Even for those graduating, some continuing assistance may be needed.

An important requirement is that the business incubator should itself be run as a business, with the perspective of becoming self-supporting when operations are fully established. Initial support is almost always provided by state and city authorities, for instance, in the form of a low-rent (or no-rent) building and some operating expenses. There are, however, some for-profit incubators.

The TBI is often linked to a technical university, research laboratory or technology park. It is service-oriented and depends upon the use of shared equipment, libraries and facilities from the university/laboratory linkage, as well as professional services from an informal network of community supporters.

Export processing zones, industrial estates and technology parks are longer-term and large-scale real estate developments, which first started in the 1970s. Then, in the early 1980s, the business incubator concept was developed as a micro-environment for nurturing early-stage businesses. It is possible and desirable to place the TBI adjacent to an existing technology or industrial park so that the incubator clients can benefit from synergies with other park members,
and from the credibility of the park. In addition, graduating clients can move to a bigger space in the park.

**TBI characteristics**

The distinguishing characteristics of the incubator can be summarized as follows:

- It will provide a managed workspace, offering shared facilities, focused advisory services and interaction among clients, available on short-notice and without a long-term commitment.
- It will have a small management team, with core competencies to provide early diagnosis and treatment or referral through a wide network of professionals and friends in the local community.
- It will make a careful selection of start-up groups as incubator clients, seeing to their nurturing and growth. The selection and focused help, of course, account for a better survival rate (two or three times greater for incubated businesses compared to those outside the incubator).
- Flexible exit policies usually require that the business ‘graduates’ when the scale of operations, staff and sales have expanded to a point where the space and service requirements go beyond the incubator’s capacity – usually after two to three years, or even longer for technology companies, or when the business does not portend success.
- The business incubator itself should run as a business, with the perspective of becoming fairly self-supporting when operations are well established.
- Initial support is provided by government, universities or other sponsors, in the form of a low (or no) rent vacant building and operating subsidies, until rents and fees from clients grow to match operating expenses. However, many continue on net subsidy, and the support provider sees this as an investment in the social infrastructure, while also deriving some tax, foreign-investment, culture-change and other benefits.
- In addition, outreach assistance is provided to affiliate businesses on their own premises; but, if the TBI has no clients within its walls to benefit from interaction and focused attention, then it takes on the role of a small business development centre and lacks the defining features of an incubator.

Typically, of the total number of ventures served at US incubators, 60% are resident-clients, 33% are affiliates being served outside the incubator, and 7% are anchor tenants (NBIA Tenth Anniversary Survey).

The well-planned and prudently managed TBI provides a variety of advantages to its different sponsors. These include:

- For the affiliated university, the TBI offers opportunities to build firms led by local faculty, scientists and engineers, while enabling society to reap the rewards from investment in local universities and research institutes. The incubator also provides opportunities for know-how licensing fees and for employment – part-time and full-time – for university students and graduates.
- For the start-up venture, the incubator offers the promise of creating a new business with better prospects of survival, reduced delays in bringing products to the market and reduced costs.
- For the community, these businesses stimulate economic activity, with collateral growth of suppliers and customers. Significant tertiary effects come from the incubator playing a catalytic role in developing entrepreneurial skills, modifying the culture of university–research–industry relations, and positively influencing national policies towards small businesses.
- For the state, the TBI demonstrates its commitment to promote employment, technology commercialization, regional development and exports, while securing returns as corporate and personal taxes (which are typically many times the net subsidy). In addition to, say, twenty surviving businesses, with over 200 workers, within the incubator, the real benefit to the state and community comes from the companies that leave and grow (some at rates of 20%–30% per year).
- While employment creation is usually a desired objective, the TBI essentially creates enterprises, some of which may grow to create jobs and wealth, while others will fail.

**Incubator sponsors, objectives and types**

The incubation system is remarkably flexible and serves a variety of purposes and stakeholders. Depending on the preferences of the leading sponsors, it can be designed to meet specific objectives and specific sectors, whether for-profit or (more typically) not-for-profit, with a variety of linkages and configurations based on needs and conditions (see Figure 4).
Incubator objectives

The primary purpose of an incubation centre is to help new businesses succeed and thereby create wealth and employment opportunities. Incubators also help their clients overcome the bottlenecks and regulatory hurdles to rapid business formation by facilitating the start-up process and through access to a community support network. The social purposes are to foster an entrepreneurial culture and to increase the participation of indigenous entrepreneurs in the national economy, including youth, women and other special groups.

Specific objectives, depending upon the incubator’s focus, may include:

- **Technological innovation** — through interaction with universities and research complexes, for initiating innovative products, processes and services to domestic and export markets.
- **Regional development** — by decentralizing economic activity away from urban concentrations, mobilizing local resources, and enabling informal businesses to move into the formal sector. Rural incubators, many of which focus on agribusiness, are of special interest in developing countries.
- **Industrial subcontracting** — by linking up with industrial estates, facilitating the downsizing/privatization of conglomerates, and providing specialist components to them and opportunities for ‘spin-offs’.
- **International outreach** — by helping foreign companies to quickly enter the domestic market with local partners, or to use the incubator as a base to export to third-country markets.
- **Targeted development of special groups** — such as artists, or culinary specialists, agribusiness, expatriate nationals (as in China) or new immigrants (as in Israel).
- **Empowerment** of women — (as in Samarkand, Uzbekistan; Tianjin, China; Volkhov, the Russian Federation), or of disadvantaged communities (as in South Africa).

Spatial configurations

To achieve the above objectives, a variety of incubator arrangements are being used and, of course, they need not be called ‘incubators’. The full-service incubator is the most prevalent, providing a broad range of assistance to start-up business within its premises, while utilizing the hardware facilities and other resources in a neighbouring community. Virtual incubators help nurture start-up businesses in existing laboratories or workspaces, until they can move to a physical incubator.

In developing countries, culture and conditions require a high proportion of rural and town businesses to be home-based. As noted, most incubators, today, serve both clients within their walls and affiliates outside, to assist a much larger clientele. At times, an incubator can remain ‘open’ to assess the market and culture, before moving to a renovated building, and later, if necessary, constructing a custom-built facility.

The open (‘without walls’) incubator has no physical residential requirements, and serves selected firms on an outreach basis, in the manner of a small business support centre, such as the SBDCs in the USA. There are similarities with incubators, but also significant differences, as seen in Table 1.

Each system has its own niche to meet special local needs and conditions. Some incubator types are listed hereafter.

Incubator types

**TBIs with Research/University Linkages:** Whereas in the USA only about one-third of incubators have a technology focus, in many developing countries the university-linked technology-business incubator is predominant, as noted above. In China, Mexico, the Czech Republic, Indonesia, and Turkey, incubators have university affiliations and technology commercialization objectives. This may be due as much to recent public perceptions of the image of technology, as to the disappointment with traditional means of transforming research to marketable products. Such linkages provide a means for university faculty, researchers and graduate students to become entrepreneurs, utilizing technical capabilities to meet needs and opportunities.

**Single-sector TBIs** (such as biotechnology, computer software or advanced materials): It is often advisable to start with mixed clients, until the orientation of local entrepreneurs is discernible. India has made good progress in computer software, with dynamic private business and international partners. It has also benefited from focused state support including Software Technology Parks with characteristics of technology incubators.
Objectives

<table>
<thead>
<tr>
<th>Productive</th>
<th>Self-employment</th>
<th>Industrial</th>
<th>R&amp;D</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment</td>
<td></td>
<td>Sub-contracting</td>
<td>Utilization</td>
<td>Development</td>
</tr>
</tbody>
</table>

Sponsors:

| Private Enterprise | University Research | National Government | Local Government |

University Research

Technology Park

Small Entrepreneurs → Business Incubator → Successful Business

Industrial Park

Rural Community

Types:

<table>
<thead>
<tr>
<th>Modified Incubator</th>
<th>Expatriate Nationals</th>
<th>Rural Incubator</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic Without Walls</td>
<td></td>
<td></td>
<td></td>
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</table>

Coverage:

<table>
<thead>
<tr>
<th>Start-ups</th>
<th>Expansion / Diversification</th>
<th>Research / Services</th>
<th>Consulting Distributing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early-stage</td>
<td></td>
<td></td>
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</tbody>
</table>

Figure 4: Business incubator sponsors and purposes

Table 1: Comparison of SBDCs and incubators

<table>
<thead>
<tr>
<th>SBDCs</th>
<th>Incubators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typically, all SMEs are served</td>
<td>Careful selection of start-up ventures</td>
</tr>
<tr>
<td>General business advice and training</td>
<td>Focused counselling, HRD, networking</td>
</tr>
<tr>
<td>Usually free services</td>
<td>Fees + rent for space</td>
</tr>
<tr>
<td>‘Out-patient clinic’</td>
<td>Affordable space + affiliates</td>
</tr>
<tr>
<td>No exit requirements</td>
<td>Stipulated exit policy</td>
</tr>
<tr>
<td>Largely state subsidized</td>
<td>Move towards sustainability</td>
</tr>
<tr>
<td>Low capital/operation costs</td>
<td>Higher costs, delays</td>
</tr>
</tbody>
</table>
Some sectoral incubators are often called industrial clusters. But a cluster typically is an agglomeration of firms that come together in a town or district due to locational advantages, cooperate and compete, specializing flexibly in some component of the supply chain. Later, a city or other agencies may come in to strengthen some cooperative functions.

State or regional development incubators: Such an incubator would seem appropriate in many developing country situations, particularly if it can focus on local resources, such as agribusiness, light engineering, and special artisanal skills, primarily for regional markets and with a potential for going even further afield. In practice, it has often been difficult to find good institutional bases or the entrepreneurial framework for rural development incubators.

New Economy incubators, based on the sobering lessons learned from the dot-com bubble era: These typically are linked to (or have in-house) seed venture capital fund and management consultant capability, and focus on information and communications technologies (ICT).

Public/private partnerships: Given the technical infrastructure of an urban environment or an industrial estate, large enterprises can be linked to the development of small businesses as vendors for components and services. Generally, the private sector will participate in the incubation process only after the state has financed the establishment and initial operations. There are notable exceptions, such as the Federation of Industry Sao Paulo, Brazil (FIESP), which has mobilized its own resources to run a dozen incubators.

Corporate for-profit incubators: These have yet to emerge in developing countries although they already exist in developed countries (about 15% of all incubators in the USA). The potential exists to create innovative partnerships that match the needs of large enterprises for new growth opportunities with the needs of small enterprises for customers and financing. An example is the Lexington Business Center in Elkhart, Indiana, USA.

Hub incubator with satellites: Local conditions may enable one management group to serve multiple sites. This has the advantage of using the experience of a core team to save costs and serve a larger clientele. This configuration, however, requires a strong core multi-functional management team.

Internal incubators: These may be promoted by a large corporation wanting to spin off new ventures, or in the process of downsizing. The corporation may also wish to give teams full flexibility to develop a new product, or to create intrapreneurial suppliers who will work in symbiosis with it. A corporate incubator may invest in or acquire know-how developed by the clients.

International Business Incubator: This facilitates the entry of small foreign businesses, including returned expatriates, into local markets. A complementary programme may support the export of local manufactures and services (see Box 2).

With the acceleration of the flows of trade, investment and experts – as well as outsourced goods and services – in a globalizing economy, incubators are now being designed to facilitate the ‘soft-landing’ of small enterprises from one country into another. One approach is to carefully select an incubator with international potentials, and then to enhance its management and physical capabilities to serve foreign ventures. The Association of Asian Business Incubation (AABI) has recently initiated a programme to select ‘AABI Incubators’ for such exchanges of workspaces and services.

E-incubators: At another level, there is a need – especially in developing countries – for a new paradigm, whereby incubators can serve much larger numbers of businesses, formal and informal, in more cost-effective ways. ICT now makes distance learning and counselling possible for communities in remote regions. While the concept is attractive, it needs to be demonstrated in practice. Community-based organizations have the experience and commitment for such approaches.

Services
The rationale of incubation is to provide services and facilities that add value to selected firms at affordable costs, in order to help them survive and grow. The services generally offered, depending on local needs, include:

• affordable space on flexible leases, and broad-band connectivity
• shared facilities, such as a receptionist, conference room, office equipment
• desk space and internet facility to help initiate a business plan
• business planning, accounting and legal advisory services
Incubation Concepts

BOX 2: INTERNATIONAL BUSINESS INCUBATORS (IBI)

Essentially, the small technology business wanting to enter a large, complex market needs: a reduction of perceived risk; a local partner, preferably with a record of success and trust; market opportunities for maximum return at optimal investment; protection of all property, intellectual and otherwise; and services for information and interpretation, travel and accommodation. Some of these requirements can be met by the IBI mode.

The Chinese IBI program was designed (in 1996) by Business & Technology Development Strategies, New York, and the TORCH Expert team to offer competent support and modern facilities to international technology-based companies and Chinese scholars living abroad, in order to attract their technology and investment into local Chinese markets. Further, it is to provide support to local companies in their efforts to export their products, services and technology, as well as to enhance their competitiveness abroad.

Eight existing technology incubators were transformed into IBIs: Beijing-Fengtai and Tianjin (in north China), Shanghai, Suzhou, Wuhan and Xi’an (east and center), Chengdu and Chongqing (south-west). Importantly, the organizational structures have to be transformed to a market system, the mindsets of management teams significantly changed, and the marketing of the IBIs pursued aggressively abroad. Some clients at the new IBIs have an international orientation – mainly overseas Chinese.

IBI, Silicon Valley, California, has hosted 200 delegations in the last three years since inception, and assisted 29 companies from 17 countries on problems of marketing, tax, laws, immigration, and so on. It occupies 1,600 m2 of space downtown and is supported by a variety of local and regional sponsors. IBI also assists countries in opening offices in Silicon Valley.

The Ben Craig Center at the University of North Carolina, Charlotte, has worked with 40 companies in pursuing opportunities in the USA, and currently houses the subsidiaries of 5 foreign companies; its satellite incubator at Geilenkirchen, Germany, has helped 15 US-based companies explore European markets.

- trade and technology information services
- facilitation to help overcome regulatory and other obstacles
- mentoring by board members and other specialists, on a one-on-one basis
- accessing seed venture capital and angel networks, possibly in-house
- training for skills development in business management and marketing
- assistance in recruitment of staff
- outreach counselling/training for affiliate-businesses outside the incubator
- access to university faculty, facilities, students
- legal advice on the protection of intellectual property
- business promotion and public relations opportunities
- linkages to international and national support groups.

Some of the above services are included in the rent paid for space. Electricity, communications and the use of university facilities may be charged for on a cost-recovery basis, while counselling, training and special services may require payment of fees.

**Poor, good, best practice**

Incubators that function in a weak business environment are often characterized by the ‘poor practices’ of a haphazard selection process for clients, a public official or faculty member serving as manager, desultory support services (if any), and low rentals as the main attraction. At the other end of the spectrum, the facilities in a knowledge framework benefit from strong policy support, and charge near-market rents and offer innovative, value-adding services. Typically, their performances are the result of careful preparation, adequate funding, an entrepreneurial culture and an enabling environment, specific to a given time and place.

The so-called ‘best practices’ are not easily defined, much less measured. They are location- and time-specific. Practices and performance are influenced by factors such
as public policy and regulations, the quality of business infrastructure, the patterns of culture, the historical legacy, and geographical location. Incubators should indeed search for good practices wherever available, and then adapt these, building upon what they have and know, towards good practices suited to their own constraints and conditions. Raising the majority of incubators to the higher middle ground, as they ‘reconnoitre globally, reengineer locally’, would help enhance the image of the whole incubation industry.

Government’s initial support makes sense under specific conditions, such as when this support:

- helps overcome market constraints, and improves the access to information, financial resources and divisible workspace not freely available
- extends the state’s role in providing public goods – knowledge, research and infrastructure
- becomes a visible symbol of the state’s commitment to the creation of good jobs (direct, indirect and through multiplier effects)
- stimulates innovation and entrepreneurship as prime forces in the new economy
- promotes the cultures of technology commercialization, risk-taking and teamwork
- reduces the costs and consequences of business failures, and facilitates the transition from a command to a market economy
- empowers backward areas (urban and rural), youth and women entrepreneurs, and promotes employment in the longer term
- helps develop synergy between university, research, and state and civil society
- generates taxes paid by corporations and workers, typically in excess of net subsidy, and raises incomes, sales and exports for the community and country.

Further, such support is warranted when:

- it is limited to the starting up of the establishment, and is not a continual subsidy
- there is client satisfaction at the services received, common costs saved and reduced delays in bringing products to the market, as well as satisfaction at benefits to the community.

The initiation of incubators in Uzbekistan, beginning in 1994, is a good example of self-owned businesses, hitherto unknown, influencing public policy to become more friendly to them. A similar phenomenon occurred in Poland and China. In Israel, public support for incubators is directed essentially towards creating opportunities for émigrés and attracting foreign investment.

**The downside of incubators**

Clearly, incubation has its share of problems and risks, and its sceptics as well as its proponents. It has been argued that the business incubator is:

- **elitist**, as it caters to a selected group of potential ‘winners’;
- **dependent on government support** in policy, infrastructure and initial funding
- **limited in outreach**, with marginal contribution to job creation in the short term
- **expensive**, as it provides focused assistance and workspaces to a selected few
- **duplicative**, as it may undermine existing markets for business services
- **skills-intensive**, as it requires experienced management teams.

And, further, they:

- **may not provide additionality**, as most businesses start outside an incubator
- **create dependency**, by sheltering entrepreneurs from harsh market realities
- **require a good business infrastructure**, in a good location
- **require external subsidy for some years**, before it can become self-sustainable.

These are valid concerns, and the downside can best be tackled by realistic briefings to policy-makers, careful planning of the incubator, consensus building, patient support and strong leadership.

**Enter (and exit) the Internet Incubator**

During the 1999–2000 period, some 400 for-profit internet incubators were started in the USA and elsewhere, owing to the expanding opportunities that the internet seemed to offer, and due, in part, to unrealistic expectations. Usually, this model provides an attractive and a furnished workspace, allowing companies to begin work

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as soon as they move in, and focused consulting services
to a small growth-potential group of firms; takes equity in
the companies through an affiliated venture capital facility;
and accelerates them to the market. The majority of these
incubators – once considered the paradigm of best practice –
have closed. Nevertheless, the equity-based, networked
model has taught some lessons and continues to be relevant
(Hansen et al., 2000).

The internet is not an evolutionary but a revolutionary
development, and the future does indeed warrant optimism,
tempered by respect for the laws of economics and the
behaviour of stock markets. The internet is growing rapidly
in the developing world, with ICT-related incubators op-
erating in many of these nations, such as in Brazil, South
Korea, India and Dubai. Nations that do not prepare for
this now may well miss the information revolution, just as
they missed the industrial revolution.

For those wanting to make the transition in this mil-
leum to the sustainable incubator model, the primary
requirements are to: develop a smart workspace with strong
e-infrastructure, enhance the quality of management, offer
marketing and networking support for client-companies,
actively promote the innovation process, and facilitate ac-

developing and offering business profiles
The entrepreneur-group should normally come to the
incubator with its own innovation to be developed into a
business. However, in places where entrepreneurial ener-
gies have been long repressed – as in some Arab states
that have depended on oil revenues and expatriate workers,
or in some of the Commonwealth of Independent States
(CIS) countries – there is interest in the incubator itself
identifying and offering ‘model’ business opportunities.
A potential entrepreneur contemplating the creation of a
business can then draw from such a bank of project profiles,
possibly at the end of a training programme.

The idea of some authority telling a person what prod-

3. Proceedings of 14th NBIA conference, San Jose, Calif.

3. Proceedings of 14th NBIA conference, San Jose, Calif.

Linkages to universities, research institutes,
and technology parks
The role of the government is essentially to develop the
technical infrastructure, policy framework and initial
financial resources, and to help catalyse the venture crea-
tion process. The private sector assists through mentoring,
in-kind support, ‘patrons club’ membership subscriptions,
and subcontracts. Typically, business invests in an incu-
bator when effectiveness is demonstrated; or as a social
responsibility; to acquire innovations; for intrapreneuring;
or for quick profits (as in the case of the new internet in-
cubators). The technical university and technological research
institute constitute the knowledge base for the formation
of technical skills and innovations. Professional networking
and community involvement provide the underpinning of
support.

Role of the university
The TBI could be affiliated with a university but should
not be administered or controlled by one. The outlook of
university administrators is often technical, bureaucratic
or political – seldom entrepreneurial. When the university
is willing to provide a vacant space for the incubator and
to cover some of its costs, it is not easy for the incubator
Board and manager to fend off attempts at interference in
operations. The professors may see the incubator clients
as sources of consulting income and business experience,
as well as offering opportunities for graduate students to
write dissertations and to earn some money. The incubator
clients may not be fully aware of the faculty’s strengths or
potential for technology transfer.
An earlier study of the value-added services offered by selected universities to their incubator clients had placed the use of a photocopier, 'student employees' and 'rent breaks' at the top of the ranking (Mian, 1996). Today, however, some of the most successful incubators in the USA and in China are linked to universities and technology parks. The TBI can benefit by linkage to a knowledge base, as in the case of the new Panama Technology Business Accelerator (Lalkaka, 2001).

The major disconnects between the cultures of academia and of enterprises are:

- **Time-cycles:** Most professors and students are driven by the academic schedule and by longer cycles, such as student graduation, or getting tenure or sabbaticals. By contrast, entrepreneurs need to respond to the cycles of the markets being targeted.

- **Urgency:** At the university, schedules may be related to preparing for final exams, whereas, for businesses, schedules will mean meeting payrolls and delivering products to meet deadlines.

- **Institutional accounting vs. enterprise accounting:** For the university, the incentive is to spend what is in their budget, or lose it. Success, for those who do not need to generate income to cover expenses, is a bigger budget allocation and more staff. Administrator's seek to protect university reputations, not take risks.

- **Lack of experience** among faculty members in working with small companies, and differences between the cultures of researchers (to publish) and of business executives (to be secretive): Executives may have difficulty in accepting advice and be uncomfortable in public roles. Faculties tend to be highly autonomous, narrowly focused and publication-driven, and to operate in a bureaucratic framework.

For these reasons, spin-offs from faculty research to an incubator company are quite rare in developing countries. There is also the reluctance to sully one’s academic reputation by engaging in commercial activity, rather than getting recognition for publishing learned papers. This is changing with the emergence of the ‘entrepreneurial university’ and its move towards the ‘learning enterprise’, offering the future prospect of a knowledge development continuum. Furthermore, private corporate universities are emerging, which combine the best of both worlds.

**Advantages**

*Advantages to the TBI* of linkage with a reputed technical university include the prestige that this institution brings, as well as the dynamic exchange of ideas and the rigour of academic analyses. The incubator can benefit by synergies through the use of computer systems, libraries, data bases, special scientific equipment, faculty expertise, internships and part-time employment of senior students.

In turn, the *university benefits* from the practical demonstrations of technology transfer, as well as from the use of the TBI as a ‘living laboratory’ for students and the faculty. The challenge is to mobilize the reputation (and resources) of the university, while maintaining the autonomy (and mission) of the incubator management team. When the ethical and conflict-of-interest guidelines are clearly drawn, the interactions between faculty and business can be fruitful.

A university with a strong research activity can help catalyse technology venture creation in the region by generating competent personnel, as Stanford University’s proximity to Silicon Valley demonstrates (see Box 3).

Aside from universities with affiliated incubators, some business schools are starting their own incubator, such as the University of California/Berkeley, University of Wisconsin/Madison, University of North Carolina/Chapel Hill and Babson College. The faculty and its facilities, together with access to a variety of contacts and venture capitalists, enable students to put their learning into practice. Other schools, such as Stanford University, prefer that their B-school students devote all their energy to acquiring knowledge before venturing forth.

The Advanced Technology Development Center (ATDC) at the Georgia Institute of Technology, Atlanta; the Ben Craig Center (BCC) at the University of North Carolina, Charlotte; and the Rensselaer Polytechnic Institute (RPI Incubator) in New York, are among the best of the fifty or so US university-related incubators. Other notable examples are the Boulder Technology Incubator in Colorado and the Austin Technology Incubator in Texas (Culp and Shapira, 1997; Mian, S., 1996; Wolfe et al., 2001). The University City Science Center in Philadelphia has links to two dozen educational institutions in the area.

In addition to commercializing university-generated research results, the TBI could be linked to a research institute. A recent example is the Advanced Materials
Technology Incubator, which is adjacent to the Advanced Research Center International at Hyderabad, India. Biominas Fundacion, Belo Horizonte, Brazil, started incubating ventures in a publicly funded research laboratory until it could develop a custom-built, world-class facility adjacent to the laboratory.

**Linkages to technology parks**

The main characteristics of technology parks are outlined in Box 3. Good examples of the TBI.tech park nexus include the Rensselaer incubator and park in Troy, New York, and the incubation-complex within the Technology Park, Malaysia.

There is significant potential for synergies between a technology-based incubator and a technology park if they are sited in proximity to each other, as indicated in Figure 5, provided that it is planned from the start, that all players are induced to buy-in to this potential, and that the administration proactively pursues it (Lalkaka and Bishop, 1995). The incubator can be the first 'building block' of a future park.

Competition may develop between university research, publicly-funded research, and research by incubator companies for the same contract funds. The positive effect would be the potential for efficiency through competition, whereas the negative one would be the potential neglect of priority programmes or cross-subsidization by more profitable ones.

Seamless integration of learning and venture creation may be served both by locating companies within the university buildings and within a technology park, as in the case of the Korea Advanced Institute of Science and Technology High Tech Venture Center incubator at Taedok.

Corporate incubators: While the upsurge in dot-coms is now history, the for-profit corporate incubators continue. Typically, in this model, a corporation invests its resources

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**BOX 3: THE SILICON VALLEY PHENOMENON**

The clustering of related activities in a single sector is centuries old. In the USA, for instance, the automotive industry grew around Detroit, entertainment around Hollywood, and financial services on Wall Street. The Silicon Valley and Route 128 phenomena for growing high-tech ventures has attracted much attention abroad, which some of the advanced industrializing countries have sought to replicate, with very limited success.

The genesis of Silicon Valley may be dated to the 1940s, when Stanford University engineering professor Frederick Terman inculcated a pioneering spirit in his classes. At Terman's instigation and with US$538 in seed capital, Bill Hewlett and Dave Packard set up shop in their garage in Palo Alto to produce their first marketable product—an audio-oscillator. Sixty years later, the fifty-mile strip from San Francisco–Berkeley to San Jose, California, has grown to over 7,000 electronics and software companies. Its 300,000 top scientists include some one-third born abroad. Silicon Valley has its ups and downs, and in good times a dozen new firms (and many new millionaires) were created each week. NASA started an incubator in Silicon Valley to help commercialize its research results, and Panasonic did the same to help attract innovations; the reason for their success is the ethos of the Valley.

What makes this ‘innovation machine’ at Silicon Valley really work? A prime factor is the prevailing culture of risk-taking, competitiveness, and the freedom to fail. There is the critical mass of professional services from lawyers and accountants, the technical infrastructure of prototyping new devices and outsourcing components, and the venture capital. And there are the universities to provide a stream of engineers and scientists with innovations and ambition.

Silicon Valley’s entrepreneurial culture and work-ethic have been threatened: the internet, a product of the Valley in some ways, makes it now possible for new internet ventures to settle in other regions where talent is more readily available, housing costs lower, and congestion less important. The Valley has been the victim of its own success: the oversupply of chips, the exuberant venture capitalists, and the high productivity that drives down costs. Much of the manufacturing is now done in China and Taiwan, while the Valley focuses on better design, solutions and integration.
A technology park can be defined as an enhanced property-based development that has a high-quality physical environment in a park-like setting; is located adjacent to or at a reasonable distance from a research institute or technical university; and emphasizes activities promoting the growth of research, technology commercialization and knowledge-based enterprises. Depending on context and focus, it could be called a research park, science park, or science-based industrial park. It may vary in size, from covering a few hectares to becoming a city in itself, a ‘technopolis’, with the clustering of technology-related activities.

The technology park has strong programme components, that:

• Take advantage of the proximity to sources of significant intellectual capital, and surroundings and policy support conducive to the growth of technology businesses. When a new park is being planned, an incubation facility can be integrated into the organizing concept, with special attention to the architectural features of buildings, traffic circulation, and other design elements.

• Support technology firms and state institutes in a large pre-zoned area with extensive infrastructure, in order to promote technology development and economic growth. For long-term success, the park must move beyond real estate to real innovation.

Salient features are the purchase of land to build (often with significant limitations), or a long-term lease to rent pre-built space, with physical infrastructure and utility services provided by the park authority. The relationship with a university or research institute is a key feature. The role of governments can range from a major and direct support – where the state provides concessional land, financial incentives and anchor tenants – to a more laissez-faire approach, providing mainly normal infrastructure under commercial terms.

A technology park represents a major investment of US$10 million and above, over a time horizon of a decade and more, from conception to maturity. Unfortunately, some of these developments have performed poorly, and several have taken many years to mature. It is therefore essential that a new facility be carefully planned from the outset, to address the strategic purposes, to achieve expected benefits at projected costs, and to meet the expectations of the potential partners and clients. It is also important that initial expectations be set realistically, with output indicators to guide project development.

While varying in levels of performance and success, technology parks have steadily increased in number, to around 600 worldwide today. The bulk of this growth took place in the 1980s. While growth has slowed in industrial countries, there has been considerable activity in Asia, Central Europe and Brazil.

Further, there is a trend towards the convergence of support mechanisms, interlinked to a park and incubator. Good examples of convergence are found in Singapore and Taiwan. The Hsinchu Science Based Industrial Park (Taiwan) in its fourth expansion will cover 1,400 acres, and expects to have over 300 companies with 80,000 employees in the near future, and sales revenues of US$50 billion. The Tainan Park (Taiwan) takes park–neighbourhood integration even further, and includes a technology business incubation system. Tainan could soon have even more impact than Hsinchu.
and lends its prestige to incubate start-ups in order to further its corporate objectives. The Panasonic incubator at Cuppertino, California, seeks to create strategic partnerships for attracting innovations, whereas the Reuters incubators promote innovations by their own employees. Monsanto’s Nidus Center has broader economic development goals of stimulating entrepreneurship in the region. Intelligent Systems invests in early-stage technology ventures.

The export of technology-based manufactured products and services is an indicator of the degree of technology development. In most cases, small businesses do not export directly, and often lack the technology for raising productivity/quality and the information for export-oriented marketing. At the same time, small high-tech companies do not have the staff and other resources to enter complex foreign markets.

In order to meet these outward-looking objectives, incubators should facilitate joint ventures and strategic partnerships, while linking up to export promotion agencies.

**Incubator programmes in selected countries**

Developments in incubation in selected countries are summarized in Annex 1. The countries under study include China, South Korea, India, Egypt, South Africa, Turkey, Poland, the USA and Germany. Most incubators in these countries deal with technology-related products. The China programme – with about 450 incubators (second only to the USA, which has over 1,000) – is notable for the large state investment of around US$1.5 billion, its vast floor-space of 121 million square feet, its 24,000 client ventures employing 440,000 persons, and its 8,400 graduates.

The situation and conditions for incubation are changing rapidly, and information quickly becomes outdated. Moreover, it is difficult to give precise numbers of incubators, as definitions vary among countries. In most countries – developing and developed – state agencies provide the bulk of initial support for start-up and operations.
The variety of incubator practices and preferences underline the need to develop models and operations based on each nation’s specific conditions and culture. Without agreed metrics and definitions among countries, and given the inadequate attention paid by incubator managers to collecting (and sharing) information on their operations, it is difficult to assess performances. UNDP, the United Nations Industrial Development Organisation (UNIDO) and the Organization of American States (OAS) undertook a joint initial review in seven countries (Brazil, Mexico, Nigeria, Turkey, Poland, Czech Republic and China). The countries differ markedly and their incubators cover a wide range of sizes, characteristics and performances.

An assessment of impacts (Molnar et al., 1996) showed that the average annual operating budget of a group of US incubators was US$278,240. Average annual subsidies were estimated at $86,254 on operations, and $25,000 on investment over seven years. The number of jobs created in this period was 702, giving a public subsidy cost of $1,109 per job. The tax revenues generated were reported at $4.96 per dollar of public subsidy. These studies have had their critics.

In Germany, the average investments (DM 2,000 to DM 4,000 per square metre of incubator space, mostly as state subsidy) and annual operating costs (between DM 500,000 and DM 1 million) are high in relation to net subsidy. To the pertinent query: ‘What proportion of ventures would in fact start without an incubator?’, the answers range from 3% to 20%. Only one-third of the German incubators cover their own costs, the rest being currently subsidized.

**EU benchmarking study**

A recent EU study concludes that there is potentially much to be learned from sharing experiences between the US and the European incubation industries.

The proportion of for-profit incubators appears to be higher in Europe, while the clients per incubator, success rate for start-ups, and equity investments in ventures, are higher in US incubators. The EU study asked: ‘If the incubator stopped receiving cash subsidies, what would be the effect on operations?’ The responses indicate that many incubators would stop altogether or have to reduce their activities, although more so in Europe than in the US.

### Table 2: Comparisons between Europe and the USA

<table>
<thead>
<tr>
<th>Key Performance Indicators</th>
<th>European survey data</th>
<th>US survey data</th>
</tr>
</thead>
<tbody>
<tr>
<td>For-profit / Not-for-profit</td>
<td>21.8% / 76.9%</td>
<td>11.5% / 86.5%</td>
</tr>
<tr>
<td>Average occupancy rate</td>
<td>85%</td>
<td>81%</td>
</tr>
<tr>
<td>Survival rate</td>
<td>84.2%</td>
<td>87%</td>
</tr>
<tr>
<td>Equity position</td>
<td>Yes – 7.7%</td>
<td>Yes – 34.6%</td>
</tr>
<tr>
<td>Number of tenants per incubator</td>
<td>24.7 (average), 18 (median)</td>
<td>14.5 (average), 11 (median)</td>
</tr>
<tr>
<td>Average number of FTE jobs per tenant company</td>
<td>6.2</td>
<td>7.7</td>
</tr>
<tr>
<td>Average new jobs created per tenant per year</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>Amount of incubator space</td>
<td>5,860 (average), 3,000 (median)</td>
<td>–</td>
</tr>
<tr>
<td>Graduation policy?</td>
<td>Yes – 79.5%</td>
<td>Yes – 90.4%</td>
</tr>
<tr>
<td>Number of incubator staff</td>
<td>5.6</td>
<td>–</td>
</tr>
</tbody>
</table>
Table 3: Financial sustainability of incubators

<table>
<thead>
<tr>
<th>Financial sustainability</th>
<th>Europe</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Activities could be maintained at current levels</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>(2) Activities would have to be reduced significantly</td>
<td>31</td>
<td>12</td>
</tr>
<tr>
<td>(3) Incubator activities would stop altogether</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>(4) Not relevant – incubator does not receive subsidies</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>(5) No Response/ Blank</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>52</td>
</tr>
</tbody>
</table>

**BOX 5: ACTION POINTS**

Incubators are a mechanism to augment venture creation and to reduce failure rates. The cause of the reduction is a combination of the selection process and the focused support. Incubators have a variety of sponsors, objectives and arrangements, of which the TBI has been dominant, but mixed-use and empowerment models are emerging. To initiate a program with good chances of success:

- **Start with realistic expectations, as incubators are no panacea.** The best-suited incubation model has to be selected depending on the needs of the local market and the objectives of the sponsors.
- **Seek strong partners, identify incubator purpose and type, and seek policy support.** In all countries – rich and poor – state support is essential to start the incubators and to supplement its initial revenues. These, together with investments in knowledge and infrastructure with supportive policy, are government responsibilities.
- **Develop a linkage to a technical university, providing access to faculty, graduate students, facilities, laboratories and, importantly, to the prestige of its reputation.** But the vastly different cultures of academia and business must first be reconciled.
- **Develop the potential of synergy between the technology incubator and the technology park.** They differ in scope and scale but have significant complementarities. Indeed, the prospects of self-sustainability could be improved by maximizing the potential of the real estate.
- **Review the experiences of TBIs (and innovation centres) in North America and Europe, where infrastructure conditions are more favourable, and where the state for innovation is strong.**
- **Explore the new incubation arrangements, such as the ‘software technology parks’ in India, and the ‘international business incubators’ in China.**
- **Note that incubators, like other forms of small-business services, aside from having their benefits, are subject to misconceptions and are not without their limitations and downsides.** When carefully planned and prudently managed, they can be effective.

The TBI modality faces specific challenges in implementation, especially in developing economies, where the infrastructure is weak and entrepreneurial energy has hitherto been repressed. The failure to observe ‘good practices’ imperils the incubator’s performance and can curtail its contribution to national economic development. While approaches under different conditions vary markedly, all counties can learn much from each other.

It is worth noting that developing and restructuring countries are attempting to accomplish, in only two generations, a technological transformation which took industrial countries two centuries to set up, under more favourable conditions. While mistakes will be made, the trend is positive.
Planning the TBI

The preparatory process commences with a proper understanding of the incubation system, the collection of information by accessing the internet, and the discussion with consultants and managers of incubators in the area. The next essential step, sometimes neglected, is the preparation of a feasibility study to examine viability in the given context, followed by a business plan, if warranted.

Typically, the preparatory work comprising feasibility and business planning for an incubator requires six to nine months, and the implementation may take about another nine months – that is, a total of over a year before the TBI can start operations. With strong leadership and assurance of funding, the process can be accelerated; however, it may take much longer where the concept is new and the funding, location selection and other prerequisites, are delayed.

Preparatory process – feasibility process and business plan

The overall planning process is outlined in Figure 6.

Step 1: An orientation seminar is useful to familiarize potential sponsors with the incubation concept – not to promote it. This process should present objective information on characteristics and objectives, problems and potentials, and on the responsibilities and obligations of the key players (that is, government, universities, research institutes, state and private enterprises, banking systems, NGOs and local administrations). Government enabling policies and financial support are essential, initially. Moreover, large enterprises in the state and private sectors share responsibility, and will reap longer-term benefits by helping create businesses.

Step 2: Once it has been decided to explore the incubation option, a small study-team of key selected sponsors could undertake a well-prepared reconnaissance tour, not a junket, to TBIs and related developments in industrial and industrializing countries. The opportunity may be taken to attend an annual conference of one of the major incubator associations (such as NBIA, USA; EBN, Europe; ANZABI, Australia; ADT, Germany; ANPROTEC, Brazil; or AABI, Asia), as well as the emerging national incubator associations. Incubator developers – and the ventures they nurture – learn best from each other.

Step 3: From the start, responsibility has to be established to coordinate programme development. Decisions are needed on the mode of preparing the feasibility analysis. These can be taken by a local group, supplemented if necessary by a consulting company with relevant country experience and a strong skills set. A comprehensive Request for Proposals has to be drafted for all the analyses needed to make informed decisions. Concurrently, careful analyses should help identify and promote a flow of entrepreneurs with potential innovations for entry into the incubator.

Step 4: The feasibility study then looks at viability parameters, especially the sources of entrepreneurs and their requirements that the incubator must be designed to meet. Essentially: (1) entrepreneur surveys and field research are required to indicate the local profile, attitudes, needs, and entrepreneur
Figure 6: Incubator preparation process
pool in the community, in order to determine the services and facilities for which the TBI is to be designed; (2) provisional incubator sites and possible building options have to be assessed; (3) stakeholders and sponsors need to be identified; and (4) investment/working capital requirements estimated and financial viability must be assessed.

**Step 5:** Consensus has to be developed among the key players on the viability of the programme, followed, if warranted, by the *business plan* to determine the management, the market and the money needed, to identify options regarding objectives, facilities and services designs, and to analyse investment, income and expense estimates, risk factors, working capital, marketing, implementation and other parameters. These studies require the expertise of ‘been-there-done-that’ consultants, as well as a pooling together of community knowledge. The analyses must take fully into account the uniqueness of each situation, the local culture and politics.

**Step 6:** The critical assumptions have to be discussed and the results validated, before the final decisions are taken on whether and how to proceed further with the TBI implementation process. A long-term view must be taken of sustainable operations, together with sensitivity analyses for worse-case scenarios. Expect the unexpected, and be prepared for it. Trust but verify: possible university and other sponsors must be finalized, and their objectives in contemplating the establishment of a technology-related incubator must be formulated in the form of a *mission statement*.

**Step 7:** Once the project is approved, legal incorporation has to be studied and executed, and the funding pursued seriously. In most situations, the *negotiations for financing* of the TBI programme can be most time-consuming and frustrating. Yet, without assurance that funds will be available, the project cannot be pursued.

**Step 8:** The selection of a good location in a strong business infrastructure, and the finalization of plans to renovate an existing vacant space or build a custom-designed facility, are critical tasks.

**Step 9:** The appropriate governance and organization structure is put in place and the Board of Directors formally appointed, with the necessary responsibilities and authority (see Chapter 5). A proactive, experienced Board with a mix of experience in the entrepreneurial venture creation process is a prerequisite.

**Step 10:** Concurrently, the Board needs to start recruitment of a competent, entrepreneurial incubator *manager*. When the legal and financial hurdles are overcome, the manager can be appointed, trained, properly remunerated and made responsible for following up on the implementation activities. The above process usually needs a ‘champion’ to drive it forward over the inevitable obstacles.

**Preparation of feasibility study and business plan**

Clearly, incubator establishment is *not* a linear process, but an iterative system in which some actions move in parallel and reinforce each other. Moreover, the process is flexible (like the incubation concept itself) and no fixed formula applies in all situations. The local environment, the dynamics, and serendipity play their part.

If there is no in-house capacity to prepare a feasibility study, a small steering group can be formed to pursue the process and prepare a Request for Proposal (RFP) to invite bids on a competitive basis. The short list of consulting firms should have knowledge of country conditions and experience of the type of facilities envisaged. If it is necessary to use international consultants, the latter should be encouraged to utilize local experts for their local knowledge.

The expert time deployed in preparing a competent feasibility study/business plan depends on a variety of factors, such as technical and political complexity, and the experience of the team. Typically, for such tasks, expert inputs (excluding support, travel and other activities) could be approximately as shown in Table 4. The feasibility study and business plan together can cost from, say, US$30,000 to $80,000, depending on the extent of work and travel required by the RFP, and on available local support.

If the assessment of the ‘market’ for incubation services and confirmation of the ‘reservoir’ of potential incubator clients are positive, and if the incubator seems to be warranted, the business plan study can follow without a long hiatus in order to maintain momentum and to define the financial and operational parameters.

If a major *incubator network* is envisaged, it is desirable to start with a *pilot* project in order to test the adaptability...
of local conditions to the incubation concept. Once in place, additional facilities can be designed, incorporating lessons learned.

Ten basic questions to be addressed in the Preparatory Process:

1. What are the sources, profiles, and expectations of potential ‘incubatees’? What will be the basic type and business model to serve their needs?
2. What will be the TBI mission and objectives? Is there a consensus on these among sponsors, entrepreneurs and the community? Is ‘patient money’ available?
3. Can a business-like managing Board and team, as well as strategic alliances with external partners, be developed? Who is the ‘champion’ driving the process?
4. What is the potential for linkages with a technical university, a research institute, an industrial complex or an economic development agency? How can the involvement of the community, of the city, and of state governments be mobilized?
5. Does the selected location have a strong infrastructure, and potentials for new technology-based businesses, a professional network, and a supportive community?
6. Is the selected building appropriate – in size, layout, e-infrastructure and costs? And if a new building is to be constructed, does its location and design promote interactions among clients towards sustainable operations?
7. How will the TBI be organized to provide value-adding advisory, training, information and networking services, not readily available in the area?
8. Will funding for investment and operations become available for the TBI? And can the TBI facilitate access to credit and equity capital for its clients?
9. In estimating financial resources for the business plan, what are income and expense assumptions towards sustainability in, say, five years of operations? What outcomes under adverse conditions does the sensitivity analysis indicate?
10. Can the TBI concept be adapted to the local political, economic and social conditions, with strong state support, and without state interference?

A suggested outline of a feasibility analysis and business plan for a TBI is given in Box 6.

The outline must be adapted for the real purposes to be achieved and for the resources available. The incubator ‘champion’ would help pursue the process, mobilize political and business forces, and overcome all obstacles until success is achieved. Furthermore, the Board must provide continuous supervision, monitoring, and mentoring but without day-to-day interference in the management of the facility. It should assume responsibility towards mobilizing the total financial resources to meet the needs of the programme as well as those of its client-ventures.

The Board should also revisit the initial approaches towards preparing a strategic business plan, based on the experience and new information gained.

Assessing the demand for incubator services

Assessing small business needs is still more of an art than a science. Entrepreneurs have a strong sense of self-esteem and tend to blame external obstacles for their problems rather than acknowledge their own shortcomings. In surveys in Egypt and Sri Lanka, a lack of financing topped the list, as shown in Table 5.

In practice, however, the real needs may be for counselling and training on management and marketing, on overcoming bureaucratic obstacles, and on production processes and

### Table 4: Level of effort for preparatory studies

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Chief investigator (workdays)</th>
<th>Co-investigators (workdays)</th>
<th>Total number of work-days (approximate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory tasks</td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Feasibility study</td>
<td>10</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Business plan</td>
<td>10</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td><strong>30</strong></td>
<td><strong>65</strong></td>
<td><strong>95</strong></td>
</tr>
</tbody>
</table>
quality. It is possible to survey the profile of potential clients and TBI services needed through individual interviews with representatives, and through structured but informal ‘focus groups’ of ten to fifteen persons each. A simple instrument for such a discussion is given in Annex 2.

**Mission statement**

An organization’s mission statement is intended to state the fundamental reasons for its existence and to outline the scope of its activities. It provides the overall directions for its growth. A mission statement looks to the future and reflects the unique strengths of the group (see Box 7).

It must be emphasized that a mission statement and business plans, while useful, do not give results; *only people and process produce results*. The plan is a road map that shows the way; only a driver and vehicle will get you there. Once you have reached the initial destination, throw away this plan, and make a new strategic one for the new reality.

**Key players and legal incorporation**

*Governance* is here defined as the system of key players bearing responsibility for the functioning, monitoring and evaluation of the operations, performance, impact and sustainability, of the incubator programme. Each player has a special role and specific responsibilities. Problems arise when these roles (and the accountability, commitment and costs that go with them) at the outset are not properly defined, understood or implemented. The responsibilities of key players are generally as follows:

The **main sponsor** should secure, coordinate and monitor national and international financial resources and other inputs to support the establishment and operation of incubator.

The **Board of Directors** should establish the supportive policy and regulatory environment for small enterprises to start and grow, provide overall guidance, and help link it to related national and international activities.

A **steering committee** could be useful in the initial stages for active supervision of the implementation process and initial operations. An **advisory committee** of experts could assist the Board and manager on assessing candidate-firms for entry into the incubator, on issues of exit, and on emergent technical problems.

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**BOX 6: SUGGESTED OUTLINE OF AN INCUBATOR BUSINESS PLAN**

**Executive summary**

1. **Background and history:** Proposed project
2. **Market for TBI services:**
   - Market analyses for services and space – in demand and available
   - Profiles of clients and affiliates
   - Competition – direct and indirect
3. **TBI objectives – type and focus:**
   - Identification of sponsors/stakeholders
   - University–research and institute–business–banking linkages
   - Legal and implementation arrangements
4. **Location and building surveys:**
   - Recommended sites and building options
   - Build consensus on all of the above before proceeding further!
5. **Organization and management:**
   - Board, committees and the management team
6. **Facilities and services design:**
   - Training, counselling, networking and finance
7. **Operations:**
   - Tenant selection, exit process and policies
   - Marketing strategy
8. **Financing:**
   - Major assumptions
   - Balance sheet and cash flow, sensitivity, sources and use of funds
   - Benefits and risk assessments
9. **Implementation, monitoring, evaluation:**
   - Process and milestones

**Annexes:**

- Sponsors/management team qualifications
- Building layouts
- Photographs
- Standard lease and service agreements, etc.
A competent incubator management team is critical to success. The selection, remuneration and development of good incubator managers is perhaps the most crucial problem for TBIs in all countries.

Community and service providers serve as the network of community services to support the incubator and to mentor the clients, in mutual interest.

A local intermediary bank should promptly appraise the loan applications of prospective clients and, where warranted, provide credits based on a flexible interpretation of procedures.

Strategic alliances: Arrangements could be useful with relevant organizations, in the country and abroad, for technology, marketing, and professional services.

Incubator clients: The entrepreneur-as-client is the central figure, and the reason for the existence of the incubator. The term ‘client’ or ‘member’ is preferred to ‘tenant’, as in some countries it may take months to remove an underperforming ‘tenant’ from the incubator. Moreover, the incubator’s purpose is to provide services, not just space.

Affiliates: These are selected businesses who pay a nominal fee for preferred access to incubator services but prefer to work in their own premises.

Anchor tenants: These are a few established companies invited to enter the incubator, whose reputation gives credibility and whose experience provides mentoring to the start-up firms. Anchor tenants are required to pay higher rental rates and not required to exit the incubator. Their activities should be supportive of the incubator’s objectives; however, a large bank, restaurant or supermarket, may be admitted to occupy the ground floor (as in some incubators in China) to help cross-subsidize the rentals paid by the tenants.

Common responsibilities: While the above list indicates individual roles, all the key players also share overarching responsibilities. These include: special efforts to provide value-adding services, to raise the revenues (rentals and

### Table 5: Egyptian entrepreneur needs

<table>
<thead>
<tr>
<th>Services needed</th>
<th>Priority</th>
<th>May be needed</th>
<th>Not needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing</td>
<td>156</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Marketing help</td>
<td>135</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Work space</td>
<td>123</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Product design</td>
<td>97</td>
<td>28</td>
<td>39</td>
</tr>
<tr>
<td>Training</td>
<td>90</td>
<td>48</td>
<td>26</td>
</tr>
<tr>
<td>Production help</td>
<td>87</td>
<td>50</td>
<td>27</td>
</tr>
<tr>
<td>Prototype development</td>
<td>87</td>
<td>49</td>
<td>28</td>
</tr>
<tr>
<td>Business/tech information</td>
<td>84</td>
<td>54</td>
<td>22</td>
</tr>
<tr>
<td>Contacts with government</td>
<td>62</td>
<td>81</td>
<td>21</td>
</tr>
<tr>
<td>Contacts with business</td>
<td>60</td>
<td>80</td>
<td>24</td>
</tr>
</tbody>
</table>

*Source: Business & Technology Development Strategies LLC, 1995.*
services) and to optimize expenses, allowing the incubator to move towards operational break-even in about five years.

Attracting private sector support

Incubators should neither be viewed nor operated as government projects or university departments. The programme has to mobilize corporate support at the earliest in order to:

- be managed like the entrepreneurial enterprises themselves,
- be progressively weaned away from initial dependence upon state support,
- play an important role in economic development strategies at the provincial level as well as nationwide, and
- participate actively in the global supply chain for products and services.

It may not be able to attract the above support if it is viewed only as an extension of a state or university.

Business persons can play a strong mentoring role and promote the subcontracting of supplies from incubator clients; they can be induced to participate when the benefits to them, as well as their corporate social responsibility, are demonstrated. One way is to form a ‘friends of the incubator’ club, where corporations take membership through annual subscriptions, to mutual advantage; they meet their corporate responsibility and are given preferred access to subcontracting of work, investing in and acquiring the innovations being developed. Another way is to name a conference room or other space – or indeed the whole incubator – after a major corporate sponsor.

Legal status

The choice of legal identity for the TBI will be influenced by the unique characteristics of the incubation modality, the main sponsor’s own mandate and by-laws, as well as the regulatory and tax legislation. If possible, the incubator should be a separate legal entity, and not an adjunct or sub-unit of an existing government agency, university or research laboratory. The latter’s cultures and operating modes may be adverse to entrepreneurial behaviour.

In this context, the legal structure of business incubators in other countries is of interest. For example, in Belo Horizonte, Minas Gerais state, *Brazil*, Fundaçao Biominas is a not-for-profit foundation with the objectives of promoting biotechnology in the state and establishing a technology business incubator. It has a strong Board comprising private business, Ministries of Scientific Research and Education, the Belo Horizonte municipality, a government research institute (CETEC) and financing agency (FINEP).

*Israel*, which began opening incubators in 1991, now has about twenty-eight technology incubators. These are set up as limited companies or not-for-profit associations, under the overall auspices of the Office of the Chief Scientist, Ministry of Industry and Trade.

The technology incubators of Middle East Technical University and Istanbul Technical University, *Turkey*, are set up as foundations by the respective universities, and supported financially by the Small and Medium Industry Development Organization of the Ministry of Industry.

In *South Africa*, the South African Breweries’ business incubator, at Johannesburg, operates currently as a ‘department’ of the corporation, under the Noah Programme. The emerging GODISA incubator network is presently under the guidance of the Ministry of Science and Technology, while the three Biotechnology Regional Innovation Centers are being set up as trusts.

Since legislation prevents the Social Fund for Development, in *Egypt*, from directly implementing an incubator programme, it has established an NGO (the Egyptian Incubator Association) to be the implementing agency for the programme. Such an arrangement can work efficiently if there is full trust between the leaderships of the sponsor/financier, the NGO and the local incubator boards.

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**BOX 7: MISSION STATEMENT – LEXINGTON BUSINESS CENTER**

In the case of an incubator program, the mission expresses the consensus among sponsors and stakeholders on its purposes (such as economic revitalization, job creation or technology commercialization) as well as its main client groups. For example, the mission statement of the for-profit incubator Lexington Business Center (in Elkhart, Indiana) reads as follows: ‘The Center is dedicated to providing a diverse environment in which new and emerging companies can develop and grow, with the end result being profitable businesses, capital generation, economic diversity and a positive impact on the Elkhart Community’.
In the United States, about 20% of all incubators (2000 NBIA survey) are private for-profit companies, and 20% are university-affiliated. The bulk of the others are public or public-private not-for-profit entities. At Northwestern University, for example, the business incubator started as a department of the university and is now part of the for-profit Research Park. The Lexington Incubator in Elkhart, Indiana, is a private for-profit facility, and has shown a positive return on investment in the second year from start-up.

A separate entity for a new TBI would have the substantial advantage of providing an autonomous status and a business-like image, and of securing the full participation of universities, municipalities and local institutions.

**Location and building criteria**

Prior to selecting the incubator site a number of basic decisions have to be addressed. The framework of the incubator feasibility plan should have been assembled and provisional sites listed, sponsors identified, objectives established, and projections made of the facilities and services needed.

**Selecting the location**

The definition of objectives should include a decision on the types of businesses to be targeted for occupancy (i.e. research, commercialization, manufacturing, services, etc.). Each has different space and facility requirements. The geographical location of the incubator plays a major role in its success or failure, as much as the companies that are housed there. Sites should be selected that offer a vibrant and supportive business community (both public and private); close proximity to universities, service providers, Industrial and Technology Parks (for graduating companies to move to); and an adequate business infrastructure (see Box 8).

The incubator project needs to be compatible with the neighbourhood. For example, one would not want to locate a light manufacturing operation in a residential area, or by the same token, locate a retail service operation in a rural agricultural area.

In preparing a Master Plan for Egypt’s incubator programme, BTDS, the consultants developed a scoring process with qualitative–quantitative weighted factors to assess the readiness and supportive conditions; then, together with local experts, travelling by plane, jeep (with armed guards) and felucca, from Aswan to Alexandria, we helped prioritize the locations (and vacant building spaces offered at each town).

Recent experience in developing countries highlights the importance of the following location factors for siting incubators:

1. **Support of local business community and service providers**

The premises should be close to a large business centre to provide easy access to commercial activity, to service providers such as accountants, consultants and lawyers, and to a pool of entrepreneurial and management talent.

**Box 8: Selecting the TBI Location**

1. **Preliminary Screening Criteria** – First, determine the preferred region in terms of:
   - Geographic location (region, state, city)
   - Linkages and proximity to university, research laboratory, business
   - Availability and area of possible sites
   - Availability of utilities and services
   - Options to renovate or build, lease or buy
   - Community support for incubator project
   - Availability of potential entrepreneurs as tenant companies
   - Availability of professional service providers
   - Space for graduating tenant

2. **Specific Site Criteria** – Then, narrow the list down to 2 or 3 sites based on:
   - Topographic considerations
   - Geographic features (flood risk, natural surroundings)
   - Transportation (access to public transportation)
   - Estimated costs of operations
   - Proximity to airport, rail, highway systems
   - Utilities (location, availability, costs); Security
   - Neighbourhood (potential for expansion, security issues)
   - Legal (title/ownership, covenants/rights)

NEGOTIATE – RECOMMEND – PURSUE
Planning

In addition, the site must be readily accessible to incubator clients as well as their potential customers. The proximity to a vibrant entrepreneurial community provides role models and mentors. This can also potentially serve as a source of investment funds and a market for tenant companies' goods.

2. Proximity to knowledge sources (education, research and industry)
The presence of large industries, technical universities and research laboratories, provides a pool of potential management talent, as well as customers and suppliers. Universities and industries may contribute spin-off businesses to be developed in the incubator.

3. Some form of sponsorship by local city, state and central government
At the initial start-up stage, incubators need the political support of government agencies as well as the financial and substantive involvement of local and state sponsors. The incubator has a better chance of sustainability at a location where such support is likely to be available.

4. Infrastructure of good transport and communications systems
The availability of transport by bus and rail, and of convenient electronic connectivity, telephone and fax facilities, is necessary for clients to obtain access to market information. Reliable electricity supply with minimal voltage fluctuations and power outages, and availability of basic raw materials likely to be used by tenant firms are also important. Access to the world community for exports and personnel movements is a consideration.

5. Availability of affordable premises with expansion provision
A facility with good layout possibilities, in a pleasant environment conducive to creative work, can be a major determinant of success. A vacant building or land for a new structure has to be secured from sponsors at low (or no) cost.

6. Vibrant business environment, with access to finance and service providers
In addition, an entrepreneurial culture and a stream of potential ‘incubatees’ with good growth potential are necessary. Evaluation of alternative sites could be done with a scoring system that would entail the complete rejection of a site based on significant problems in any one area.

An example of the dynamics of location is the Panama Technology Business Accelerator (PTBA), which is situated at a former US army base that was turned over to the country. With Panama’s excellent location at the communications crossroads, its strong banking and services sectors, its sound leadership at CoK (City of Knowledge), and the full involvement of the business and university communities, PTBA is attracting IT and related businesses. The tech park provides the grow-out space for graduating clients. The Accelerator is a good example of an initially inhospitable location – a derelict 4,000 m² of army barracks – that has been transformed into an attractive and functional facility, with US$1.2 million support from the Inter-American Development Bank, and good private and public support.

Selecting the TBI building
Renovating an existing vacant building may, in some cases, be both faster and less expensive. A ‘distressed property’ may offer a good deal, and some funding sources may prefer this option. This requires a detailed engineering survey of the condition of structures, utilities and waste-disposal systems. A space can be too large, in which case it would increase investment and working capital. Or, it can be too small and not able to generate enough income, which would affect profitability.

New construction, while initially more expensive, may have lower maintenance and operating costs. For technology incubators, it is difficult to rehabilitate an old building to meet special needs such as wet labs and e-connectivity. An attractive modern space to attract creative people is highly desirable. However, the limitations of finance may require the compromise of beginning in a renovated space.

The other major decision concerns whether to lease (with lower up-front financial requirement) or purchase (with prospects of property appreciation, use as collateral for debt financing, and security of ownership) the facility.

Important considerations for the selection of existing buildings, and for developing a new facility for the incubator, include the following:

- Gross floor space of about 2,000 m², capable of future expansion: Experience suggests that this is the optimum floor space necessary for the start of a new incubator
with about 20 to 25 companies, otherwise rental incomes would be inadequate. It may be possible to begin with less area, provided that prospect of more space is assured when needed.

- **Prompt transfer of land or of a vacant building to the incubator entity:** In order to minimize delays in start-up, it is crucial that legal title (or a clean lease, depending on the situation) to the premises (or land) can be passed promptly, and without encumbrances, to the incubator sponsors.

- **Flexible layout:** It should be possible to easily and quickly change the layout to adapt to changing tenant needs and to expand the TBI in the future. The following should be avoided: many entrances, wide corridors, high ceilings (for office space), and high energy costs for heating and cooling. The layout should provide technology-related features such as fast, reliable internet-connectivity, common office facilities, effluent disposal, and shared equipment – in the case of a biotech facility. The need for a warehouse, and parking and laboratory facilities must be kept in mind.

- **Interaction among clients:** The layout has a direct impact on internal traffic to promote interaction between clients. People-flow has to be designed to give opportunities for clients to meet each other and to encounter the management team as often as possible.

- **Good general condition of building:** A vacant building should require minimal capital investment for renovation, to ensure that resources dedicated to the TBI reach the clients and are not dissipated on the facility itself.

- **Good security:** The interior layout should provide good security though a single entry point. A common office area should be adjacent to the entrance for easy access by both clients and their customers. Interior spaces should provide access to a central office area, while ensuring confidentiality and security for individual businesses. The premises should also be environmentally safe.
### Table 6: Typical TBI services

<table>
<thead>
<tr>
<th>Secretarial Services:</th>
<th>Administrative Services:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word Processing</td>
<td>Accounting/billing</td>
</tr>
<tr>
<td>Photocopying</td>
<td>Equipment leasing</td>
</tr>
<tr>
<td>Receptionist duties</td>
<td>Health/property insurance</td>
</tr>
<tr>
<td>Clerical/Filing/Faxing</td>
<td>Janitorial services</td>
</tr>
<tr>
<td>Answering telephone calls</td>
<td>Courier/mail/business address</td>
</tr>
<tr>
<td>Documentation centre</td>
<td>IT support</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advisory Services:</th>
<th>Facilities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management counselling</td>
<td>Security</td>
</tr>
<tr>
<td>Strategic business planning</td>
<td>Conference/exhibition space</td>
</tr>
<tr>
<td>Financial management</td>
<td>Training rooms/audio-visual</td>
</tr>
<tr>
<td>Legal/patents/IPR</td>
<td>Computers/broadband-connectivity</td>
</tr>
<tr>
<td>Access to financial resources</td>
<td>Library and information</td>
</tr>
<tr>
<td>Personnel issues</td>
<td>Loading dock/warehouse</td>
</tr>
<tr>
<td>Human resource development</td>
<td>Shared laboratory/equipment</td>
</tr>
<tr>
<td>Networking to external professionals</td>
<td>Cafeteria and health club</td>
</tr>
<tr>
<td>‘Hot desks’ on time-share basis</td>
<td>R &amp; R facilities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marketing:</th>
<th>Value Adding Services:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web page links, advertising</td>
<td>New product development</td>
</tr>
<tr>
<td>Government procurement</td>
<td>Technological commercialization</td>
</tr>
<tr>
<td>Open houses, trade shows, brochures</td>
<td>Credibility/’halo effect’</td>
</tr>
<tr>
<td>Public relations in relevant media</td>
<td>Manufacturing competitiveness</td>
</tr>
<tr>
<td>International trade</td>
<td>University/business networking</td>
</tr>
<tr>
<td>Export assistance</td>
<td>Mentoring by business people</td>
</tr>
</tbody>
</table>

Planning
Table 7: Services offered by different incubator types, USA (as % of total in group)

<table>
<thead>
<tr>
<th>Services</th>
<th>Technology</th>
<th>Mixed use</th>
<th>Empowerment</th>
<th>Light manuf.</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space rental</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Management advice</td>
<td>98</td>
<td>97</td>
<td>91</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Business planning</td>
<td>87</td>
<td>82</td>
<td>92</td>
<td>83</td>
<td>94</td>
</tr>
<tr>
<td>Office services (reception, etc.)</td>
<td>83</td>
<td>87</td>
<td>92</td>
<td>71</td>
<td>100</td>
</tr>
<tr>
<td>Access to financing</td>
<td>87</td>
<td>84</td>
<td>83</td>
<td>79</td>
<td>81</td>
</tr>
<tr>
<td>Marketing assistance</td>
<td>83</td>
<td>78</td>
<td>83</td>
<td>63</td>
<td>94</td>
</tr>
<tr>
<td>Financial services/accounts</td>
<td>70</td>
<td>63</td>
<td>83</td>
<td>58</td>
<td>63</td>
</tr>
<tr>
<td>Techn. consulting</td>
<td>87</td>
<td>40</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Legal/patents/IP</td>
<td>72</td>
<td>38</td>
<td>42</td>
<td>13</td>
<td>25</td>
</tr>
</tbody>
</table>

*Source: NBIA, 10th Anniversary Survey 1985–1995*

Annex 3 includes a checklist for assessing the building.

**Facility layout**

The layout of the workspaces and common areas within the facility is crucial for incubator success. It must combine functionality with legal and safety considerations. It should also be modern and attractive in order to present a good image and to attract clients. General guidelines for developing a workable layout are provided in Box 7.

The TBI is *more than a physical facility – not just bricks and mortar*. The design and layout can play an important role in the success of the technology companies it houses. The premises need to be appropriately sized and compatible with the firms in it. Studies have found that tenant interactions play a significant role in the success of the incubator programme as well as that of the clients.

**Custom-designed or renovated**

If adequate funds and vacant land are available, a custom-designed layout offers advantages, especially for technology-specific incubators. But, in developing countries, typically financial resources are scarce and renovation of an appropriate and existing building can save both money and time.

The Ben Craig Center at the University of North Carolina, Charlotte, presents a good layout arrangement (see Annex 4). The two-storey 5,000 m² building, cost US$3.5 million, and was constructed in eleven months. It provides the technology-based clients with a creative environment, opportunities of interacting with other clients, and physical facilities to carry out their tasks.

For the Ruhuna Business Incubator in southern Sri Lanka, funds were a severe constraint. No adequate existing structure was available in the vicinity of the Agriculture Department of the University. Only a dozen small and derelict cottages on a verdant hill slope were available. Some experts insisted that incubators required a single building to promote interactions among clients; however, we were able to make the best of the available scattered cottages by developing an inter-linked campus, with a resource centre...
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at the middle and covered walkways for protection against the sun and rain. Open spaces are provided adjacent to each cottage for agribusiness storage and processing, as well as open areas for hydroponics and outdoor activities.

Good design also calls for the ability to generate an income stream sufficient to support the facilities and services. The scope of the project should be determined by ‘backing’ into the financial pro forma. In other words, the projected income stream, less the expenses and an amount for reserves, should provide for the facility to at least break-even with, and contribute to, administrative costs. Also, the amount of any debt will impact on the project and has to be factored into the financial projections.

Rules of thumb for facility designs and financial considerations are the following:

- Select a building with a gross floor space of about 2,000 m² or larger, for the incubator to derive rental income towards becoming self-reliant. Typically, the space in US incubators is around 5,000 m², and, in China, 30,000 m².
- The net rentable area should represent 65% to 70% of the gross area of the building, preferably more. Typical occupancy rates would be around 90%.
- Design client spaces in 10 m² to 150 m² units, with provision for enlarging and dividing spaces on a modular basis.
- Plan financial break-even point at, say, 70% occupancy, but in no case greater than 85%.
- Depending on the needs of clients, plan wet-labs, loading docks, storage space and open-air spaces for mechanical tasks or hydroponics, etc.
- Leverage the potential of real estate to provide, if possible, good space for ‘anchor tenants’ (even banks, supermarkets or up-scale restaurants, as in China) who pay higher rents to cross-subsidize the start-up ventures.
- Explore linking the incubator to a future technology park, each one supporting the other.
- Keep debt servicing as low as possible.
- Create an environment for creativity and the interchange of experiences between clients and with the incubator management team.
- And don’t forget the need for conference rooms, parking lots, a health club and a ‘hot desk’ space for time-sharing by those at the pre-business plan stage.

Facilities and services design

Emerging companies may have the talent, ideas and capital to launch a new venture, but may lack, to various degrees, the business know-how needed to operate it effectively. The incubator has to be equipped to provide a package of technical assistance, education, information and access to external services (see Table 6). The costs of services should be affordable for the client; yet, the incubator needs to make a profit on these.

The incubator may wish to consider inviting a client to set up a business service centre to assist clients, as well as inviting other small businesses in the area – such as a food service business (or even a hairdresser, or a children’s dance studio and arts school, as in the SODBI incubator in Kazakhstan) – to provide services to clients.

The management team should perform a support-service analysis internally as well as in the local market. This can provide direction on the type of assistance to be offered with pricing competitive for the area. Typically, services can be grouped into six categories: secretarial, administrative, consulting, facilities, marketing and value-adding (see Table 6). Services provided are usually paid for as they are used, either in cash at the time of service or with a monthly billing with no longer than thirty-day terms. Some incubators increase the rental rate and include a package of services.

The services considered important to the incubator clients in industrializing countries include: the space, credibility, counselling on business planning, marketing, accounting, management, and access to external networks. Services offered in the USA in relation to incubator types are shown in Table 7.

Design of facilities and services

While the client entry process has to be deliberate and structured, the identification for enabling the exit of firms that are not making progress according to plan has to be flexible and gentle. This is all the more important in cultures where the stigma of failure can be painful. A good practice is to start with rentals below market rates, which helps start-ups, and then to raise these progressively as a disincentive to continue longer.

Recent work in Asia, Latin America and the transition economies, indicates that, in concept, business incubation is useful in these rapidly growing economies. The North
A consultant providing advice on starting an incubator (or a new business) is often told: ‘Don’t tell me what to do, show me how to do it.’ The first question really should be whether to start at all. For success in the preparatory process:

• From the outset, mobilize politicians, government officials, business leaders, directors of technical universities and research institutes. Some may not be of much help, but one alone can be a hindrance. Build consensus at every stage, with involvement of the community and a ‘champion’.
• The first step is to clearly understand the incubation process, the potentials without the hype; then, to undertake an honest feasibility analysis based on a survey of potential entrepreneur needs; followed by the business plan, with realistic assumptions on cash flow.
• The TBI should be legally constituted so as to have reasonable autonomy and the image of a business-like facility to attract private business support. Success will depend on getting government funding while avoiding government interference.
• Select a location with a good infrastructure and decide whether financial resources likely to be available will permit construction of a new building or require renovation of vacant space. In either case, the layout should be functional and conducive to creativity, as well as being flexible and ‘friendly’.
• The incubator is a nurturing work environment, with competent managers who are committed to providing high-quality networking, counselling, training and other need-based services.
• Don’t raise high expectations but be committed to the long-term perspective. Be flexible, entrepreneurial and seize opportunities. And expect the unexpected.
• Try to think beyond the immediate time and place: Where would you like to see the incubator in the next five years? Ten years? Should you have an in-house venture equity fund by then? International alliances? An incubator franchising operation?
• Once the incubator is in operation, revisit the business plan to take into account the experience gained and the strategic changes visualized for the future.

After the basic understanding of, and consensus on, the venture creation process have been reached, the strategic business plan can help address the know-how, show-how or know-who concerns. The real learning takes place when you yourself take the plunge! It also helps enormously to maintain a dialogue with other incubators, consultants and associations that have been through this process.
American and Western European experience has, however, to be significantly modified to meet the more difficult conditions and special needs, while still retaining the unique incubation characteristics. In a difficult environment, the design of facilities and services need adaptation to take into account the following:

- **Overall flexibility:** Design flexibility in facilities and operations, to allow for uncertainty and change, available infrastructure and changing conditions.
- **Entrepreneurs:** Detailed market testing is required to help identify the services that will be needed by new entrepreneurial businesses. However, in the absence of past experience, the outcomes are more difficult to predict.
- **Admission and exit criteria:** Fairly strict entrance criteria are needed to avoid poor initial choices or nepotism, while at the same time recognizing that entrepreneurs may not have formal business plans nor means to support operations (see Annexes 5 and 6). Exit criteria have to be flexible, depending on judgements regarding the potential for success. In addition, the entrepreneur may have no space to go to after exiting, and may still need different forms of support.

**Facilities and services**

When financial resources are scarce, it may be necessary to start as a ‘virtual incubator’ in a university or laboratory, eventually moving into a renovated building or a new facility.

Technology transfer to the market place has been weak in most industrializing countries. Special efforts are needed to firmly link technology incubators to technical universities, and to critically prospect the research portfolios to identify opportunities for commercialization.

The primary focus has to be on entrepreneurship training and counselling, including business planning and small-enterprise management skills. As noted, a business centre may be in the incubator as a service provider for the clients.

A key task is to help in accessing seed capital and the longer-term risk financing. Venture capital is emerging in industrializing countries.

In countries where the business culture stresses family ties, reluctance to trust others may become a handicap. The job of the incubator manager is to promote confidence and to mobilize support networks from the local community.

**Mentoring**

The mentoring of early-stage groups by experienced business leaders from the local community can be a powerful means for promoting their enterprises and preventing mistakes. Indonesia has long had the *bapak–angkat* scheme, literally ‘father–son’, wherein corporate leaders ‘adopt’ a small business, allocate a small percentage of their turnover to them as seed capital, and guide them.

To provide significant transfers of experience, this mentoring has to be structured and regular, with the entrepreneur positioned to select the mentor based on his needs, rather than the other way around. Twinning one incubator to another could also promote the exchange of experience.

**Ownership**

Incubators will need strong government support in the initial years, and this may require some state representatives on the managing board. At the same time, private associations of entrepreneurs and commercial chambers should be brought in as partners from the start.

A national association could play a key role in promoting incubation, mobilizing support and building skills through training and publications.

**Pre- and post-incubation**

Business & Technology Development Strategies LLC (BTDS) has organized *pre-incubation workshops* at the start of programmes in Indonesia, Malaysia, and Sri Lanka, bringing together, say, twenty potential ‘incubatees’, exposing them to project profiles and incubator services, and helping them prepare pre-feasibility assessments of markets, materials and the resources needed.

In developing countries, *post-incubation* is equally important, where the graduated business can continue to receive peer support after leaving. In turn, when successful, the business supports the incubator and clients reciprocally, in the manner of university alumni. Services needed are outlined in Table 8.

**Financial Analysis**

The financial analysis is the critical part of the business plan. Incubator sponsors do not have abundant resources, and the investment and operating costs need to be carefully planned and prudently managed.
Incubator investment costs

The incubator programme needs funding for three main purposes:

1. Preparatory costs
   Capital resources are required for land and new building construction (or for vacant building space and its renovation), office equipment and furnishing, initial services for planning, training and operating, and other preparatory costs. As noted earlier, renovation may not be a preferred option for special TBI requirements such as wet labs or electronic connectivity.

   Recent experience indicates that the capital investment to establish a business incubator in a developing country situation, in an existing vacant space, could be around US$500,000 (as of 2004), depending of course on the extent of renovations, the size of facility, the equipment required, and other local factors (see Table 9).

   New construction could cost US$1 million to $2 million for the building alone, depending on its location and size, and on the predilections of the sponsors. If this level of funding is not in sight, compromises may be inevitable for an early start.

2. Operating funds
   A recent survey of US incubators indicates that average annual operating expenses vary from US$200,000, for mixed-use programmes, to over $600,000, for technology incubators (NBIA, survey 2002). Staff salaries and other expenses would be lower in many developing countries. Typically, revenues from rentals and fees do not cover expenses in the initial years. The net annual shortfall, which declines as the incubator reputation and income rise, has to be met by external sources. Provision of working capital of, say, US$500,000 would be needed to pay a declining proportion of staff, building utilities and related costs for the initial four to five years. Then, revenues from client rents, services and other income-raising methods, could cover a rising proportion of operating costs. If some of the initial costs are covered by donors and sponsors, the investment balance and working capital requirement would be lower.

   Many incubators worldwide continue to benefit from investments or in-kind support, even after the initial years.

3. To cover initial capital and investments
   In addition, seed money is essential for incubator clients to cover their initial capital and investment requirements. Such finance is usually difficult to access from commercial banks, which typically do not have the capacity to assess risks of technology ventures. Special SME support facilities or seed equity by growth capital funds is needed. The incubator could help manage a small ‘revolving fund’ for the immediate cash needs of its clients. If conditions warrant, the incubator itself could take equity positions in client firms in the future.

<table>
<thead>
<tr>
<th>Table 9: Notional capital cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on renovating a vacant building space (2,000 m²), provided without cost</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A. Building renovation</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>175 000</td>
</tr>
<tr>
<td>Electrical/mechanical work</td>
<td>75 000</td>
</tr>
<tr>
<td>Architectural/engineering design</td>
<td>30 000</td>
</tr>
<tr>
<td>Contingencies</td>
<td>20 000</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>300 000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Office equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computers, copiers, telephone exchange and furniture</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Other costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBI planning/training services</td>
</tr>
<tr>
<td>Manager and secretary salaries for the first 3 months</td>
</tr>
<tr>
<td>Miscellaneous</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
</tr>
<tr>
<td><strong>Total (approx.)</strong></td>
</tr>
</tbody>
</table>
As the incubator’s funding structure varies with the sponsor’s orientation, so do its sources of investment. Non-profit incubators may receive funding from a local municipality, community groups or foundations. Universities can help by providing buildings, in-kind support, and staff and student expertise. Joint sector sponsors utilize a combination of these tools. Experience in developed and developing countries confirms that federal, provincial and municipal agencies provide much of the financial support in the initial years.

Financial projections

Financial projections in the business plan, together with underlying projections of tenant and management activities, provide the basis for setting prices for individual items and activities, and for final decisions on how to structure and implement the TBI.

Assumptions regarding revenues

A series of assumptions form the foundation for the initial financial analysis and review. These must be tested and modified, as appropriate, in the development of the strategic operations plan, as better data becomes available. The management team must be creative, since the incubator cannot cover operations from rent income alone.

For the purpose of illustrating the estimation process, the financial projection assumptions for a business plan are outlined below. Some items may be excluded in the projections. Actual costs at specific locations would of course be different and must be assessed for each case.

1. Rent

Rent cannot be priced much below market without a corresponding subsidy from sponsors. Some TBIs are operated by universities as a part of their normal activities, underwriting the costs of buildings, insurance, security, and salaries of some support staff. Regardless of the sponsorship, the costs of development and operation of the incubator facility forms the basis for the calculation of the rents to be charged to the clients. Direct costs (such as rent or mortgage and maintenance) are incurred based on the gross floor space under management, while rental income can be derived only from the net rentable space – frequently 60%–70% of the gross, after allowing for the management team and common areas. The occupancy rate may be taken as at 80%, as clients move in and out. The rent collection rate would average, say, 95%.

The other determinant of the rental rates is the going price for comparable industrial or office space in the area. Surveys of rents in the neighbourhood are essential. For the services associated with the incubator, this rate forms the floor level, and higher rentals for the total package may be justifiable. A compromise would be to set the rental for a new tenant at, or below, the local market rate, and to increase the rents annually during the tenancy in the incubator. It may be advisable to give entrants a probationary period of, say, 6 months without any rent payable to attract the initial clients, while developing management skills and a good reputation.

Accordingly for this illustration, the rent (for office-like space) is assumed at US$5 per square metre per month in the first year, increasing to $7 in around the third year. For special laboratory facilities, leasehold improvements may be needed, and rent negotiated. As rent is the major component of income, it has to be assessed with care.

2. Services to members

The specific nature of the services depends on what is available in the community, as well as on the needs of the members and affiliates:

- **Physical services**: These might include appropriate mark-ups on telephone costs, if billed centrally, in addition to copier, fax and other office services. Some incubators provide bookkeeping and payroll services, which can generate income and serve a need.
- **Human resources development**: These might include short courses offered in conjunction with the local university, as well as help in recruiting a strong team.
- **Counselling for the businesses**: The specific advisory and coaching services offered, the prices charged, and usage, should be reviewed on a quarterly basis to ensure that only relevant services are offered and that pricing is reasonable. Mentoring, one-on-one by successful entrepreneurs – usually on a voluntary basis – can be valuable.
- **Networking and facilitation services**: These may be offered in order to access external facilities and resources, especially funds.

Income is to be generated by associated services, from a modest mark-up on utilities, through charges for fax and copies, to a range of services and training courses. Many incubators find such revenue to be a small component,
while some may bundle all such services into the rent. The rationale for such inclusion is simplified bookkeeping for the incubator and predictable costs for the client. However, a ‘bundled’ service package removes market signals about the quality and usefulness of the individual services provided; that is, as clients are obliged to pay for the whole bundle, it is difficult to tell which services are genuinely in demand.

Other incubators seek higher revenues through the aggressive development of services as a source of income. The management team will formulate specific schedules for services and determine fees to be charged for the office operations (e.g. copier and fax) at, or near, market rates. The incubator should not use its special position to undercut, even unintentionally, local entrepreneurs (e.g. photo duplication shops, travel agencies and secretarial services). The ideal situation finds the incubator staff initiating services, and then spinning off the successful services to spread the entrepreneurial success pattern.

For preliminary estimates of service revenues, an option is to take the fees paid to external consultants for training and advice, plus say 10% to 50% of the annual management team salaries, as an approximation of the income from professional services rendered to companies; this value would rise as the quality of the services is recognized by the clients.

3. Outreach services to affiliates
Affiliate members (businesses who are not resident in the incubator complex but who are enrolled for preferred access to its services against payment of a membership fee) are an important market, and intensive promotion is required. For estimation purposes, income from services offered to affiliates could be estimated as potentially up to half that generated by services to clients.

4. Provision for bad debts
The management team must make every effort to collect all outstanding payments from clients for rentals, services, or other charges. While some incubators choose not to recognize potential losses from the non-payment of bills by clients, building a reserve account for such losses is prudent and consistent with the development of conservative and attainable financial projections. The provision of about 5% of the total rental and service income is not unreasonable, depending on local experience.

5. Provision for depreciation
Providing a fund to cover the depreciation of the building and facilities can be a major challenge. However, this may not be set aside in the initial years, even if the incubator is still a ‘project’, but maintenance allocation may cover part of this fund. The donor or sponsors may provide for the replacement of equipment during the start of the ‘project’.

6. Royalties and equity dividends
Since the impact of an incubator is greatest in the early years, when member incomes are modest and their cash flow is critical, one means of realizing deferred streams of income could be to take equity in the client venture, or through a royalty arrangement, whereby the client pays back the value of the subsidized costs of services received as its sales income develops.

Taking an equity position in a client venture appears attractive, but it contains many subtle and onerous effects, including: the difficulty in cashing out the equity position; the potential conflict of interest when the incubator is landlord, consultant and shareholder; and the inhibitory effect on significant equity funding by yet another minority shareholder. The new internet-related accelerators have an in-house venture capital facility for this purpose.

A modest royalty has the advantage of providing the incubator with an additional revenue stream that can be used to enhance service offerings. A royalty of around 3% of gross revenues is a starting point for the licensing of technology from a university in the USA. Such royalty and equity arrangements may be deferred by the Board until the TBI has achieved a standing in the community.

7. Other services
An alternative is the development of a fee schedule for specific tasks that go beyond the normal services of an incubator because of their specialized nature. Table 10 shows examples of such services and of their associated fees.

8. Patrons Club contributions
A club of local businesses, private and public, can be brought together to support the incubator, through subscriptions (in the range of say US$200 to $1,000 annually per business entity depending on its turnover), as well as by sharing business acumen by one-on-one advice to the companies. Club members are given privileged access to innovations developed by the entrepreneurs, to the subcontracting of
services and components, and to opportunities for equity investments in companies. The corporate sponsors should gain value in excess of their contribution.

Assumptions regarding expenses
Staff salaries are the major item, often constituting one-half or more of expenses. Utilities and telephone/fax/copier expenses are estimated at prevailing rates and mostly recovered, with a mark-up, as revenue. Travel, promotion, and staff training have to be provided for. Other expenses include maintenance, janitorial services and insurance – part of which may be covered by a university sponsor. The major expense is in debt service, and it is therefore essential to keep loans to a minimum and at the best terms.

It may be advisable to make contributions to a depreciation fund, at acceptable rates, for the building, furniture and equipment. In the initial ‘project’ phase, some incubators postpone a depreciation charge.

Pro-forma statement of income and expenses
In making projections, the first estimates may have to be revised to arrive at values that meet project objectives and are within budget constraints. As Lord Rutherford said, ‘we haven’t got the money, so we’ve got to think’. For instance, the projection may need to be reworked in order to reduce deficits, with modifications such as the following:

- Increase rental rates and increase net rentable space.
- Add a Patrons Club to involve private business, in mutual interest.
- Take equity or royalties in tenant companies for deferred income.
- Actively promote to secure more affiliate clients to be served in situ.
- Attract a major anchor tenant, to cross-subsidize rents for the clients.
- Secure grants or subsidies from donors/sponsors.
- Reduce borrowing and obtain better credit terms, etc.
- Adopt an e-incubation or hub-satellite model to reduce staff costs at hub.
- Lease equipment and barter services.
- Invite professionals/corporations to provide pro bono services.
- Name a conference room (or the whole incubator) to honour a major donor.

The incubator management team has to continuously review cost-cutting measures, such as:

- Get deposits with orders and collect receivables promptly.
- Cut out activities that are unprofitable and not valued by clients.
- Secure volume discounts on telephone service and other utilities.
- Look for used equipment when you don’t need the latest technology.

Importantly, the Board must compensate management staff well, motivate them to higher performance, and reduce staff turnover.

A typical pattern of revenues and expenses for a TBI base case is illustrated in Table 11. This assumes a renovated building at no rent from a sponsor, with a net rentable space of 1,500 m². No provision has been made for bad debts or for depreciation. Further, no provision has been made for any taxes payable by the incubator. On the basis of the assumptions made, the TBI requires an initial amount as working capital. It shows a small surplus in the third year and a cumulative surplus in the fifth. A major expense is debt service.

Table 10: Possible fees for specialized services

<table>
<thead>
<tr>
<th>Service</th>
<th>Fee Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology brokering, sourcing, negotiating</td>
<td>negotiated</td>
</tr>
<tr>
<td>Feasibility analyses and business plan</td>
<td>US$30,000–$50,000</td>
</tr>
<tr>
<td>Financing and loan facilitation service</td>
<td>3%–5% of financing</td>
</tr>
<tr>
<td>Development and execution of sales program</td>
<td>10% of sales</td>
</tr>
<tr>
<td>Procurement assistance*</td>
<td>5%–10% of purchases</td>
</tr>
</tbody>
</table>

*Development of specifications, solicitations for requirements, and negotiation of cost and terms, as done by BIOMINAS incubator in Belo Horizonte, Brazil.
It must be emphasized that the projection in Table 11 is meant as a very rough guide to illustrate the estimation process, and in each case estimates must be made during the preparation of the business plan, based on the actual prevailing conditions.

**Sensitivity analyses**

This requires a series of modifications to the Base Case Income–Expense projections, under alternative scenarios, to indicate their effect on the year in which positive cash-flows would occur:

- What if …
  - rental rate had to be reduced by 10%?
  - bad debt provision is made?
  - income from services were deleted/bundled with rent?

**Table 11: Notional TBI operational budget (US$)**

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenues</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rents</td>
<td>60 000</td>
<td>93 000</td>
<td>126 000</td>
<td>144 000</td>
<td>162 000</td>
</tr>
<tr>
<td>Services</td>
<td>9 000</td>
<td>20 000</td>
<td>48 000</td>
<td>54 000</td>
<td>72 000</td>
</tr>
<tr>
<td>Electricity/telephone/copier</td>
<td>12 000</td>
<td>16 000</td>
<td>18 000</td>
<td>20 000</td>
<td>22 000</td>
</tr>
<tr>
<td>Patrons Club</td>
<td>2 000</td>
<td>4 000</td>
<td>6 000</td>
<td>8 000</td>
<td>12 000</td>
</tr>
<tr>
<td>Equity in clients</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>5 000</td>
<td>15 000</td>
</tr>
<tr>
<td><strong>Total income</strong></td>
<td>83 000</td>
<td>133 000</td>
<td>198 000</td>
<td>231 000</td>
<td>283 000</td>
</tr>
</tbody>
</table>

|                  |        |        |        |        |        |
| **Expenses**     |        |        |        |        |        |
| Salaries         | 60 000 | 80 000 | 85 000 | 90 000 | 95 000 |
| Electricity/telephone | 10 000 | 12 000 | 14 000 | 15 000 | 17 000 |
| Maintenance/repair | 6 000  | 7 000  | 8 000  | 8 000  | 9 000  |
| Travel/promotion | 9 000  | 8 000  | 8 000  | 8 000  | 9 000  |
| Janitorial       | 4 000  | 8 000  | 10 000 | 10 000 | 10 000 |
| Miscellaneous    | 5 000  | 6 000  | 7 000  | 9 000  | 11 000 |
| Debt service     | 40 000 | 40 000 | 40 000 | 40 000 | 40 000 |
| **Total expenses** | 134 000| 161 000| 172 000| 180 000| 191 000|

|                  |        |        |        |        |        |
| **Surplus/(Deficit)** | (51 000) | (28 000) | 26 000 | 51 000 | 92 000 |
• economic conditions forced the TBI to operate with 30% vacancy?

And what if all of the above conditions were combined?

Sources of funds for the incubator

In some countries, federal, state and city governments have special legislation, economic development and incubator financing programmes. Multi/bilateral donors can be approached for preparatory work. The university or municipality could provide the land and/or vacant space, and cover some costs such as insurance, security and janitorial service. The case of Israel is an example of significant state financial support for both incubators and their clients (see Box 11).

Another example of the role that state and city governments can play in the successful capital investment and financial structure of an incubator is that of the for-profit Lexington Business Center in Elkhart, Indiana, USA. Such support, coupled with prudent management, enables this incubator to bring an annual profit to its owners, which is then ploughed back into the expansion and improvement of facilities. The state benefits from the creation of local jobs and taxes.

In addition to state support, the incubator programme must attempt to mobilize private sector involvement, in mutual interest. Businesses can be persuaded to participate in the programme through a Patrons Club, foundations, purchases of know-how and supplies, and as investors in tenant equity and know-how. The starting point is the recognition of the kinds of assets that attract private investors.

Incubator-as-investment in enterprises

An incubator is a hybrid development tool, and a synthesis of two elements: real-estate development and enterprise development. They involve some property in the form of physical facilities from which revenues can be derived. TBIs may also want to realize the potential of investing in intellectual property such as inventions, new products, patents, research and software.

In order for property to serve as an attraction for private investment, it should preferably be in private ownership. If owned by government organizations, the state could transfer property to private control without entirely giving up its interest on the basis of a long-term (minimum twenty years) master lease. The incubator could use the property as collateral for a mortgage loan, subject to local practice. Alternatively, the government could sell the property (at a concessionaire price) with the proviso that, when use of property for incubation ceases, ownership reverts to the government.

When an incubator facility is owned by a private entity, then a wider range of financing options come into play,
such as a real estate partnership. The incubator could be the general partner, and partnership subscriptions would be sold to investors, who would thereby each obtain a share interest in the property.

Early-stage ventures that an incubator houses would be candidates for private investment. Incubator management should be in a position to help an enterprise prepare and market its investment prospectus. An alternative is royalty financing, which avoids many of the problems of either debt or equity financing.

**Incubator benefits**

Sustainability is the ability of the incubator to continue a level of effective operations even after the external subsidy has declined. Financial sustainability may be defined as Operating Revenues consistently in excess of Operating Expenditures. Certain non-cash charges are accrued, such as reserve for bad debts and depreciation, including the costs of replacing and repairing equipment and facilities. The one-time start-up costs of operations – like those of site acquisition and facility renovation/construction – and initial operating deficit may not be included in such a definition of sustainability.

**Entrepreneur benefits**

_Benefits for the member companies and affiliates_

Firms in the incubator have a greater likelihood of success. The careful selection of members and mentoring by management and by peers can triple the proportion of successfully incubated businesses (as compared to those starting in the open market). This is a major benefit for the entrepreneur and the community. Furthermore, initial rental expenses are generally lower than elsewhere and the terms of agreements are more flexible to allow for business fluctuations.

The TBI can _enhance the firm’s credibility_ for accessing capital from private financial institutions as well as other governmental programmes.

Also, the members _do business deals among themselves_. The social environment enables them to share experiences and not feel that their difficulties are unique or a result of misfortune or incompetence. The efficient networking and creation of role models are important assets. Owners are able to generate business contacts in academia, industry, government and the financial sector, which facilitate access to potential customers as well as to foreign investment and technology.

**Benefits for sponsors and local governments**

Specifically, the benefits include the following:

- By augmenting the infrastructure for small- and medium-scale business growth, _regional development_ is promoted.
- By providing focused support, the business incubator will create viable businesses and _well-paid jobs_. Some of these businesses expand rapidly, creating even larger direct and indirect employment in the future.
- In addition – based on experience in several countries – one direct job created in a technology-based business can create up to one indirect job.
- Further, the incubator would assist existing companies outside the building, through _outreach services_.

The above activities would generate income for the community and taxes for the state. The US experience indicates that there could be a gain of US$4 to $5 from corporate taxes for every dollar of public subsidy.

Through the diversification of technology-based products and services, as well as improved productivity and quality, increased exports from the region can be expected.

Strengthened linkages with a university provide consultant opportunities for the faculty and business experience for the students.

Existing large businesses would be able to develop new sources for components and services through subcontracting, as well as opportunities for acquiring innovations and for investments in new ventures. Through the ‘mentoring’ of entrepreneurs, the large companies would share their experience and fulfill social responsibilities. The incubator could actively promote women-managed ventures, or be designed specifically for them. It could also empower youth and seniors.

Overall, a properly managed business incubator programme could provide significant benefits to the local community in economic terms, as well as enhancing the synergy between enterprise, university, research and government.

**Specific benefits**

The following specific benefits can be expected from a technology incubator:

1. _Enterprise creation_

The typical pattern of enterprises to enter, graduate and leave the incubator is projected in Table 12. At the end of
the 4-year initial operations, the incubator could support some 24 companies on the premises (plus maybe an equal number of external affiliates). Fifteen companies would have graduated and 12 failed, out of the total of 51 entrants.

As the pilot incubator gains experience in selecting and supporting businesses, projected graduation success rates can be expected to increase. The hypothetical example given above indicates a failure rate of under 25%, which conforms to typical incubator results. (Failures of ventures outside the incubator may be much higher in many countries.)

2. Employment generation
Typically, the entrepreneur groups selected to enter the incubator may have an average of 2 persons each, growing to an average of, say, 12 persons after 4 years. Thus, the companies in the incubator can create direct jobs (as well as jobs at the ‘affiliates’ outside the incubator). For each direct job, 1 to 1.5 indirect jobs may be created by those bringing supplies and services to incubator clients and those utilizing its outputs.

Among graduated companies, some may still fail, but a small proportion of those in knowledge-based products and services would grow exponentially – some at 20%–30% a year – creating significant employment, incomes, taxes and export. Incubation cost per good job would decline.

3. Other benefits
In addition, there are benefits which are not readily quantifiable, such as the building of technical and management capacity; commercialization of university research; promotion of entrepreneurship and changes in the ‘culture’ of university–industry–government relationships; improved survival rates and enhanced growth of companies in the incubator programme, resulting in higher sales; income and taxes for the community; and, overall, an enhancement of the pride and self-esteem of the members of the community.

A rigorous financial analysis points to the problems to overcome and the potentials.'

Table 12: Possible new venture formation

<table>
<thead>
<tr>
<th>Incubator</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>New entrants</td>
<td>8</td>
<td>12</td>
<td>15</td>
<td>16</td>
<td>51</td>
</tr>
<tr>
<td>Graduating companies</td>
<td>–</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Terminating companies</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Resident companies – year end</td>
<td>7</td>
<td>14</td>
<td>21</td>
<td>24</td>
<td>–</td>
</tr>
</tbody>
</table>
BOX 12: ACTION POINTS

The TBI is a microeconomic tool for nurturing entrepreneurs who create enterprises, which in turn generate direct and indirect jobs, as well as other non-quantifiable benefits. It is not a grand solution – a panacea – to problems endemic in a society.

- Keep the capital investment for renovation and other preparatory costs down, possibly under US$500,000 – provided that a vacant building in reasonably good condition can be secured. This ‘real estate model’ calls for an up-front grant that will lower the need for credit and reduce the debt burden.
- In the ‘real estate plus investment/subsidy model’, the sponsor or donor supports the capital investment and some supplement to the operating revenues. In the cash flow projections, structure the rent, services and other income to generally cover operating expenses within, say, the fifth year of operation. This is the roadmap towards financial sustainability and offers the prospective of reducing (or eliminating) dependence on external support.
- The ‘venture capital model’ presents a risk for the incubator in the early stages. Deferred revenues may be pursued, as these can lower the burden on the start-up client, while maintaining the prospect of future income. This could be done through a royalty arrangement that recovers the estimated ‘subsidy’ to the business when it has achieved revenues. Or, it could be done through an in-house seed equity fund.
- As the incubator ramps up to sustainability, the benefits to sponsors, university, community and state (in taxes realized and jobs created per dollar of net subsidy) can be significant. But above all, the entrepreneur is helped to survive and graduate as an enterprise.
- Be realistic in expectations regarding what the incubator can (and cannot) do. It cannot create entrepreneurs, but it can nurture them. It cannot show financial profits in the short-term, but it can be cost-effective in the long-term.

Society resists change, and there will always be someone to come up with a reason why things cannot be done. But, as Samuel Johnson pointed out, ‘nothing will ever be attempted if all possible objections must first be overcome’.
Implementation actions

Following on the preparatory work, the start of the implementation stage is a big step forward. Typically, the critical path in the establishment of the TBI is taking possession of a vacant space from the city, university or other sponsors, and its renovation, or acquiring land and building the new facility. Major delays can also be caused in setting up the organization structure and mobilizing the financial resources.

Preliminary actions prior to start-up

After financing is assured and the renovation or construction underway, other tasks such as developing the management team, marketing the incubator and selecting tenant-members can be initiated. A series of activities lead up to the start of incubator operations, as shown in Table 13.

The schedule of activities shown in Table 13 provides a basic framework for pre-opening activities, and approximate time sequencing for reasonable development of an incubator programme.

Construction management

The principles of construction management are similar to those of good incubator organization: clear responsibility and concomitant accountability. Without these, misdirected use of resources will increase costs and time dramatically.

Project construction team

The main sponsors/Board establishes a construction team, under a project manager with relevant experience. It should be small, and should include a representative of the owner, contractor (on-site construction manager) and architect.

The project manager is administratively in charge of the construction project, allocates responsibilities and authority to ensure that the contractor meets the schedule, and provides technical direction. As the representative of the owner, they are responsible for adjustments to the architectural and construction plans, for decisions on behalf of the owner, and for referrals on those requiring additional approval for speedy resolution. They also initiate project related activities, such as the purchase and installation of equipment and signage outside the responsibilities of architect.

The architect is responsible for the original design and implementation of changes necessary to meet the specific goals of the owner.

The construction manager is responsible for the implementation of the architectural plans with the appropriate labour and materials as specified, construction-related permits and licenses, as well as worksite security and safety.

Project planning and scheduling

The pre-planning process begins with the consideration of the various elements of the project and their interrelationships. This forms the basis for sequencing requirements and resources, shortening the construction cycle, and minimizing cost.

Architectural drawings form the basic reference document for the construction process. They establish the general scope and details of construction, including the bill of materials. Complete sets of drawings must be available to the construction team in order that the impact of choices be specified, and opened to discussion and resolution, prior to actual
Construction. The plans must be constantly reviewed with provision for notification and authorization of change orders.

Cost (and time) estimation is the responsibility of the construction manager. The honest presentation of these elements allows the owner to make choices and keep the project on track. Knowledge of individual cost (and time) elements is essential to achieving the design results in keeping with the budget and schedule.

Project scheduling involves the careful sequencing of activities, including associated materials and labour. The gross and detailed schedules not only set time and cost benchmarks, but also provide the basis for considering trade-offs in project execution. The more complete and well-considered the schedule, the less the contractor will need to include 'contingencies' in the cost and time estimates.

Bidding for the project has both legal and technical aspects. Local law and custom must be obeyed rigorously, construction documents unambiguous, and a forum for questions provided. The timing of each element of the process must be clear, distinct and sequenced properly. Throughout the process, care to avoid both impropriety and the appearance of impropriety should guide individual actions.

Project and contract administration
The administration of the project requires a clear definition of responsibilities, with sufficient local authority delegated to

### Table 13: Milestones in establishing an incubator

<table>
<thead>
<tr>
<th>Activity</th>
<th>Month(s) from start</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Appoint a Board of Directors and hold the first Board meeting.</td>
<td>1–2</td>
</tr>
<tr>
<td>All actions hereafter are the responsibility of the Board.</td>
<td></td>
</tr>
<tr>
<td>2. Secure a consensus among key stakeholders on the purposes, type and</td>
<td>1–2</td>
</tr>
<tr>
<td>mission of incubator.</td>
<td></td>
</tr>
<tr>
<td>3. Finalize a consultancy contract for advisory services on implementation</td>
<td>1–2</td>
</tr>
<tr>
<td>and initial operations.</td>
<td></td>
</tr>
<tr>
<td>4. Complete the legal work for the establishment of the TBI.</td>
<td>2–3</td>
</tr>
<tr>
<td>5. Establish the project implementation and construction management</td>
<td>2–3</td>
</tr>
<tr>
<td>structure.</td>
<td></td>
</tr>
<tr>
<td>6. Finalize negotiations and sign lease agreements for the incubator's</td>
<td>2–3</td>
</tr>
<tr>
<td>use of land/space on a low (or no) rent basis for an initial 10-year</td>
<td></td>
</tr>
<tr>
<td>period.</td>
<td></td>
</tr>
<tr>
<td>7. Select a competent manager and arrange for hands-on apprenticeship</td>
<td>2–4</td>
</tr>
<tr>
<td>training on operating incubators.</td>
<td></td>
</tr>
<tr>
<td>8. Prepare engineering specifications, invite bids and finalize contracts</td>
<td>3–4</td>
</tr>
<tr>
<td>for construction/renovation work.</td>
<td></td>
</tr>
<tr>
<td>9. Set up a Steering Committee and an Advisory Committee.</td>
<td>3–5</td>
</tr>
<tr>
<td>10. The Board must finalize operating procedures, including selection</td>
<td>4–6</td>
</tr>
<tr>
<td>criteria, rentals, service charges and member agreement.</td>
<td></td>
</tr>
<tr>
<td>11. Initiate a selection process for 4–8 entrepreneurs to enter.</td>
<td>4–7</td>
</tr>
<tr>
<td>12. Initiate arrangements for tenant financing.</td>
<td>4–6</td>
</tr>
<tr>
<td>13. Organize a pre-incubation/entrepreneurial workshop.</td>
<td>5–6</td>
</tr>
<tr>
<td>14. The Board and management organizes services for members.</td>
<td>5–8</td>
</tr>
<tr>
<td>15. Complete the construction and procure office equipment/furniture.</td>
<td>5–9</td>
</tr>
<tr>
<td>16. Promote outreach services and enrol affiliate members.</td>
<td>6–9</td>
</tr>
<tr>
<td>17. Install the furniture and equipment and prepare to induct the first</td>
<td>7–9</td>
</tr>
<tr>
<td>batch of clients.</td>
<td></td>
</tr>
</tbody>
</table>
the construction team to make all but major changes to the project. The weekly meeting is a key event for programme coordination and resolving issues. Honest assessments of progress relative to the work plan provide opportunity for timely interventions.

Contract administration begins with the signing of agreements with the successful bidder, and ensuring that these are clear and legally appropriate. Penalty and bonus clauses, as well as standard payments, must have unambiguous trigger points and amounts. Professional fairness requires that such payments be made within the letter and spirit of the agreements. The team should routinely update cash flow forecasts; ensure that funds are available when needed to meet contractual obligations; and document all change orders, figuring the impact into the cash forecast.

The project manager is responsible for a final project walk-through to compare the result with the plan, and for putting together a final checklist of fixes required before the project ends. Finally, the contract administration, working with the project administration, should ensure that ‘as built’ drawings are completed prior to the end of the project.

Organization structure

An incubator is a business much like the clients it serves; consequently, it must be run in a businesslike way if it is to advance the cause of its clients and sponsors. This belief must begin with the formation of the incubator and continue through the daily operations, at every level and at every stage.

The organization of the TBI is based on the concept of local autonomy and control. As such, the ownership of the incubator is vested in the local sponsors, formed explicitly for this purpose. Since incubation brings together many aspects of economic development; an independent entity can facilitate interaction with existing structures.

The main components of TBI organization could be as follows:

**Under the owners, the Board of Directors (Board)** bears responsibility for the overall supervision of operations (see below). It is expected to meet quarterly or, if needed, to provide general programme monitoring and set policy to guide the day-to-day activities of the incubator. The Board may authorize one or more committees, delegating specific responsibilities to each. Such committees, meeting more frequently than the full Board, may include:

- **An Executive Committee**: Composed of a few members of the Board, the Executive Committee undertakes operational responsibilities between regular meetings of the Board. During the development stage, it may serve as a steering group to guide construction and preparatory work.
- **An Audit Committee**: Composed of, say, three members of the Board, empowered to retain independent audit for financial operations of the incubator on an annual basis.
- **A Personnel Committee**: Small group charged with responsibility of developing and implementing personnel policies for staff, including compensation of key members.
- **An Advisory Committee**: Consisting of experts drawn from the university, chamber of commerce, industry and other agencies, to advise on the selection of businesses and on the exit policy. The committee may co-opt special expertise as needed.

A suggested structure is indicated in Figure 7. This may vary from case to case to give consideration to local preferences and personalities. Furthermore, it may begin small and develop as the responsibilities and emerging needs dictate.

**Role and responsibilities of the Board**

The Board of Directors, the focal point for programme development, is composed of 10–12 members of the business, academic, and government communities, with fiduciary responsibility for the funding and operation of the incubator. It is expected to approve major capital expenditures, annual capital and operating budgets, annual audits and financial statements, and staffing levels. In addition, it may authorize entering into agreements with donors for physical and fiscal support and contracts with third parties to support the development of the incubator.

The Board’s involvement should be enhanced so that it feels a real sense of responsibility for the incubator’s success. It has to be equipped to mobilize local support, to oversee the manager’s performance, and to become a strong advocate of the interests of the incubator. Directors should have the opportunity to see operations of other incubators and to understand the spirit of entrepreneurial venture creation.

In many countries, the Board is weak and symbolic. Unless it is strong and visible, it will not attract responsible
leaders. Armed with consistent and well-reasoned policies, the incubator staff and clients will benefit from an overall guidance that ensures effective operations. The Board has the significant responsibility to mobilize financial and other resources, and to provide a liaison between the incubator (and its clients) and the university, business, banking and international communities.

The Board’s tasks comprise:

- the commission and evaluation of strategic and operation plans
- the examination of the annual operating budget and annual audit
- the establishment of policies and procedures including tenant admission/exit
- the mobilization of policy and financial support from public–private sectors
- the approval of major capital expenditures
- the employment of the incubator management team, and the setting of the terms
- assistance in mentoring clients, and facilitating sub-contracting opportunities
- the establishment and approval of reports on operations, audits and budgets
- the approval of debt and equity investments
- the performance review of key employees
- the reviewing and approval of manager’s recommendations on the selection of clients

The policies to be established by the Board include those concerning:

- legal responsibilities regarding corporate/tax status
- the annual audit by accounting professionals
- the recruitment, training and motivation of a strong management team
- the terms of staff employment, responsibility and remuneration
- admission and exit criteria and policies
- standard agreements between incubator and clients
- performance review and assessment of incubator and clients
- the management of relationships with government and sponsors
- the approval of contracts that exceed power of the manager
- the sustainability of incubator operations.

Importantly, the Board must develop the Strategic Business Plan and monitor it honestly and regularly towards meeting its objectives and outcomes.

The issues of potential conflict between the Board and the management team include differing views on the goals and respective responsibilities, perceived micro-management by the Board, the staff’s remuneration and career paths,
Implementing pressures on the management team to raise income and reduce expenses, fundraising responsibilities and, of course, internal politics. Such differences can best be resolved through mutual trust and impeccable integrity.

Staffing the incubator

The management team typically consists of a few positions, each playing a key function in the overall operation. Its size depends on the number of clients and their dominant characteristics, type and complexity of services provided; services for affiliates outside the incubator; the sponsors’ agenda; and the availability of funding. While the average team size at US incubators is about 3 persons, a TBI in a developing country may need, perhaps 5 persons, adding staff as services provided and income warrant. It must be built up progressively, based on emerging workload.

The small initial team would support approximately 15 to 20 businesses within the incubator and another, say, 20 to 50 affiliates outside. Their main responsibilities could be allocated as follows, with each person initially serving multiple functions, as needed:

- **Manager**: Responsible for overall coordination, particularly incubator promotion and performance, financial management, and networking with the Board, the university and community. He/she also has responsibility for the early identification of constraints to tenant success, followed by corrective actions and referral to competent business and technology specialists.
- **Deputy manager**: Responsible to the manager for member services, training programmes and buildings.
- **Technology adviser**: Responsible to the manager for technology support, counselling and information programmes focused on technology venture creation.
- **Administrative assistant**: Provides support to the manager on public relations, computer systems, and the administration.
- **Receptionist**: Provides support to members, with documents and information, and office-related services.
- **Security officers**: Provide twenty-four hour security operations services. Additionally, janitorial services could be contracted out to an external firm.
- **Doorman and office clerk (optional)**: Provide general support to both the management team and members.

Professional consultants may be engaged to provide specific technical support for tenant companies, in fields such as product and process design, marketing, manufacturing, accounting, law, personnel, public relations, and export.

Skills of the manager

The manager will have overall responsibility for providing leadership on the growth and day-to-day operations of the TBI. Typically, his/her qualifications include:

- a background in small-enterprise development, preferably with experience in starting and growing a self-owned business
- knowledge of the local community and of the formal/informal network of contacts within university, government, private, and non-governmental organizations
- consulting skills, in order to provide managerial, technical, and business strategy advice to clients
- familiarity with the problems of creating enterprises in advanced technologies in the rapidly globalizing environment
- excellent written/verbal communications skills and computer literacy (Proficiency in English is essential to stay abreast of international business developments.)
- interpersonal skills to interact with clients, the Board, service providers, bureaucrats and politicians; to raise funds; to liaise effectively with the stakeholders; and to handle staff – all under conditions of uncertainty
- unqualified integrity, unsurpassed enthusiasm, mature business judgement, and total commitment to the success of the incubator, its clients and the owners
- understands the design and implementation of accounting and control systems to ensure proper stewardship of resources
- available to work long hours with a dedication to make the incubator succeed.

Where is such a Renaissance person to be found? Generally, researchers and professors do not have entrepreneurial and management skills, but of course there are exceptions. Experience indicates that in many cases women have the nurturing skills to support the entrepreneur, and make good incubator managers.

A search must be undertaken to find a person with talent and potential, who must then be given opportunities for training and development, and properly remunerated. To secure the best talent, the incubator Boards usually advertise in the (inter)national media to secure a qualified pool of applicants.
Duties of the manager

The main duties of the manager are: to manage incubator finances and fundraising; to select clients and develop good rapport with them; to promote the incubator; to mobilize a support network of mentors and external professionals; to develop business advisory services; and to maintain working relationships with the Board and with the local government and community. In the early years, he/she may need to cover other functions as well, such as the extensive mobilization of sponsors, the structuring of operations for the Board, the evaluation of a range of service providers, and the organization of counselling, training and building services.

Specifically, the manager’s duties include:

Programme Promotion:

- To plan and begin a marketing campaign to raise public awareness, inform potential investors, recruit clients, and mobilize support in the community.
- To prepare monthly activity and financial reports for the Executive Committee, and quarterly reports for the Board.
- To engage, motivate, discipline and supervise the staff.
- To develop cooperative arrangements with the universities, research laboratories, banks, chambers of commerce/industry, sponsors, and other programmes dealing with SME promotion.

Facility Operations:

- To develop operating procedures to help make the incubator more efficient, and its clients more successful, and so as to meet the expectations of the community.
- To design and implement rent schedules, fee structures, and other revenue generation mechanisms, subject to Board approval, in order to move the Incubator towards financial sustainability within five years.
- To install and supervise an accounting system to ensure proper stewardship of all funds.

Support for clients and affiliates:

- To evaluate and recruit prospective clients and affiliates in close consultation with the Advisory Committee; negotiate final contracts.
- To mobilize (in)formal network(s) to assist clients in their needs, including an educational programme of seminars and workshops.
- To link clients to university/laboratory faculty and facilities for research analyses, testing, prototype development, etc.
- To facilitate interactions among clients, specifically taking advantage of opportunities to develop supplier/customer relationships.
- To organize innovative modes, such as ‘hot desks’ where simply a small workspace and computer are provided for entrepreneurs or students to initiate market studies, etc.; and to organize business plan competitions to coach clients to present their plans to venture capitalists.
- To develop a financing strategy and business development plan with each tenant as appropriate, including equipment lease/purchase, accessing banks, government, venture capital and private financial sources.

The manager’s use of time

A typical US manager spends much of the day on relationships with the Board, the university, the community and on fundraising, as shown in Table 14. Ideally, half the manager’s time should be spent on working with tenant companies.

Skills and duties of the deputy manager

The deputy manager should have complementary experience and skills to those of the manager, focusing on day-to-day operational issues. These generally include:

- consulting and training skills, to provide management/marketing support
- excellent written and verbal communication skills and computer literacy
- the ability to organize maintenance of the building, equipment and facilities
- skills in collecting accounts receivable.

The final selection of the deputy manager is done by the manager, with support from Board.

Skills and duties of the technology adviser

In a TBI, a person with a strong interest in, and experience with, issues of technology venture creation is necessary.

- While he/she need not be a scientist, technologist or engineer, a technology orientation is essential, including counselling and training experience on IPR, ethics and environmental issues.
Experience in running a knowledge company would be valuable.

Familiarity and contacts with the local technology establishment in order to access expertise and equipment.

Knowledge of sources of risk finance and due diligence process, to help firms secure research and operating capital.

Skills of the administrative assistant/receptionist

An administrative assistant is critical to the success of the incubator. Usually this person is the first contact that people will have with the incubator and clients. Generally, one person can handle the administrative duties as well as answer the telephone, until the number of clients grows to more than, say, 10 companies. The following skills are desirable:

- strong work ethic and a caring personality
- professional appearance and demeanour
- excellent computing and communication skills
- capability to organize all office equipment and shared facilities
- general knowledge of business and office procedures.

The administrative assistant will have to assume some responsibility when either the incubator manager or deputy, or both, are absent.

Expansion of the incubator staff

Often the limited financial resources of the incubator prevent the hiring of sufficient staff to optimally meet the varied needs of the clients and the facility. This requires the management team to become resourceful in securing skilled help from Board members, college students, and staff, service providers and others.

Interns can be secured through universities, student professional groups, referrals from current interns and career placement centres. Interns with special capabilities can help both incubator and clients, while acquiring added experience. However, they need to be properly supervised and given meaningful responsibilities. State programmes such as in those in Brazil and at the Advanced Technology Development Center (ATDC), at Georgia Tech, Atlanta (USA), provide support for engaging interns for the incubator as well as for its clients.

Training of the management team

Training consists of several interrelated steps, beginning with a gap analysis for each individual team member – that is, identifying those skills that, although they will be required, have not yet been acquired by the incumbent. Typically, the basis of the skill identification process starts with a written job description, approved by the Board. Skill needs change as the organization is required to meet new client demands. Defining and communicating expected training outcomes and job performance are critical.

Recent moves, as in Japan by the Japan Association of New Business Incubation Organizations (JANBO), for the accreditation of incubator managers are to be welcomed. A qualified professional, like a chartered engineer or accountant, can do much towards enhancing the image of the incubation industry and providing real benefits to the stakeholders.

The objective is to have all team members focusing on the same organizational goals. Therefore, the training should start with the contribution that each member is expected to make to these goals.

For prioritizing the needs, defining outcomes, formulating the training programme and allocating resources, the questions to be addressed are:

- Who will do the training?
- Where is the training to be done?
- What training methods are the most effective?
- Can emerging modalities of ‘e-learning’ be useful?
- Has proper budget provision been made?

Effective team training can often be done by the use of simulations, that is, some exercise that is not job-related, to
identify dysfunctional team behaviour such as aggression, withholding information, and other attitudinal problems. The incubator business plan can be used as a source of direction for the overall cohesive and functional development of the team.

While undergoing training or listening to lectures at seminars – or when these are over – it helps to prepare a ‘mind-map’, individually or collectively, noting the prerequisites, inter-connections and outcomes of the actions and issues under study.

Training programme for managers

A comprehensive programme has the following components:

1. **In-country orientation:** Apprenticeship abroad should be preceded by an in-country orientation programme to maximize effectiveness. It provides the basic knowledge of facilities available at home, the fundamentals of incubation, and the role of all key players in support of local economic development.

2. **Overseas training:** This is intended to give exposure to other existing incubators, either in an incubator with comparable operations or in the USA or Western Europe, because of the breadth of their experience.

   In addition to the managers, selected members of the Board also need to have opportunities for such learning, in order to better guide their team.

   Management staff of the first Ukraine incubator and the first Mexican incubator (CEMIT in Cuernavaca) had management training at the Rensselaer Polytechnic's incubator at Albany, New York. Managers from the Baltic States completed an apprenticeship at Rutgers University, New Jersey, and teams from the Indonesian programme were trained at the University of Texas-Austin incubator. Managers from Latin American incubators received training at Twente University, in the Netherlands, in 1992, under the auspices of the European Community’s ‘Columbus Project’.

   Intensive hands-on experience can be provided in a four-week programme, as follows:

   **Week 1:** Theoretical and practical background in new venture creation and economic development. Lectures, case histories, and the preparation of business plans, will help attendees understand the mission of incubators, as well as the concerns for the environment, equity, ethics, and gender issues.

   **Week 2:** Visits to other incubators, technology parks, and government agencies (such as those for economic development), to broaden the perspective and set up business contacts.

   **Week 3:** Practical work as an assistant/understudy to the manager of a well-run incubator to understand the role and activities of the management team and staff, and how they interact with the clients.

   **Week 4:** Work within the tenant companies, to understand the needs of clients and how they interact daily with the incubator and the community.

   The best time for the course is when work is completed on the incubator building and before clients are admitted. If done earlier, the newly appointed manager and staff will not be familiar with the environment and the requirements of their incubators, thus unable to effectively apply the knowledge gained.

3. **Continuing training in one’s home country:** This is important for the continuous development of the incubation modality, because it helps incubation develop local roots. In addition to a review of practices and current global experiences, the training gives the opportunity to reflect on the operations of the incubator in the context of its mission, and to help resolve vexing technical and political issues. Incubator managers and their start-up clients can learn much from each other, through practical examples and precepts.

   The incubator manager and all staff should attend training. In addition, each tenant may send one representative, preferably the manager. Officials from the university, local government, chambers of commerce and other organizations working with the incubator, may also be encouraged to participate. The faculty should include university faculty to discuss local business and patent laws, accounting, and tax and financing procedures, as well as speakers from the local community, such as successful business people, and employees of government agencies, banks, etc.

   As an incubator management team and entrepreneurs are busy people, a course could include:
• an audit of operations
• detailed operating plans, procedures, and management systems and a budget for the incubator
• business plans for selected clients (and for the incubator itself, if no such plan exists) with financing plans and applications
• an evaluation of the course, to provide a feedback for future improvements.

In this way, the initial incubator business plan will be re-evaluated on the basis of the operating experience to date. An update of the tenant requirements will also emerge. The incubator budget and break-even analysis will be refined by the manager, who then will be recommitted to achieving the required goals.

Importantly, continuing education involves participation in national societies to develop potential contacts as well as hone professional skills. These include NBIA (National Business Incubation Association, Athens, Ohio), EBN (European Business Innovation Center Network), ADT (Arbeitsgemeinschaft Deutscher Technologie und Grunderzentren, Germany), ANPROTEC (Brazil), AMIEPAT (Mexico City), HESPA (Higher Education Science Park Association, Moscow), JANBO (Japan), KOBIA (South Korea), CASTIC (China), and CABIN (Central Asia).

Marketing the incubator

The TBI, no less than its members, must establish an effective marketing programme. Not only does this encourage quality businesses to join, but it also disseminates the message of entrepreneurship to the general public. In designing the business plan, several issues must be addressed. These include:

• Besides space, what other services will be provided to add value to client operations, based on their needs and gaps in the market?
• What kinds of prospective entrepreneurs are to be targeted, initially and later on?
• Where, when and how will the marketing campaign be conducted? (If it is too early, expectations are needlessly raised.)

The main marketing methods used by successful incubators include:

• printed materials such as brochures, fact sheets, news items and newsletters;
• speeches to influential groups, news conferences and workshops;
• media, print advertising and public announcements;
• communication channels such as internet web pages and links;
• participation in exhibitions and fairs; and
• involvement of local civic and business leaders.

Every significant event related to the incubator becomes an opportunity for media coverage; this includes members entering and leaving, awards and recognition, technologies developed, financing secured, lectures delivered, VIP visits, and foreign tours.

Influential Board members have a special responsibility to spread the message, and so does the management team. News of success breeds success, news of dissatisfaction with the incubator, or of failure of a client, can quickly damage an incubator’s reputation, taking months to rebuild it.

An aggressive marketing programme takes two parallel tracks:

The first track is directed at the entrepreneur (the target market) and explains the benefits of being associated with the TBI. In some countries, it is not considered useful to be resident in an incubator, or to pay fees for the services provided, or, having entered, to ever leave the incubator. Moreover, these attitudes are aggravated by a mistrust of programmes sponsored in the past by government institutions. The marketing programme needs to dispel such fears.

The management team has to focus its efforts in getting that first dynamic group of firms into the facility and insuring their success, as this will help attract others. The goal should be to enlist perhaps five to eight entrepreneurial firms initially. Incubator literature – brochures, marketing pieces, direct-mail items, and so on – needs to address the important role that the incubator and its management will play in the growth of the firms.

The second track is directed at the key sponsors, particularly the university, city administration and private sector. The marketing programme needs to explicate clearly the concepts of the incubator and the benefits of supporting it.

In the case of university-related TBIs, it is not enough that the top administration endorses the incubator, but
also that faculty members in related departments, including the business school, are fully briefed and brought on board. Their positive involvement can significantly help, whereas their dissatisfaction will hurt an incubator’s prospects. This is also true of government officials and members of the incubator Board, whose involvement is essential (but whose interference is not). Lao Tzu’s advice to the governors of a state applies as well to the Board of an incubator: ‘Govern the state by being straightforward; wage war by being crafty; but win the empire by not being meddlesome’.

Selecting tenant companies

Incubator operations include the full range of activities directed towards selecting entrepreneurs, servicing and graduating them. The key to successful operation is providing targeted support to help the entrepreneurial ventures develop and grow.

Business plans for entry to TBI

The incubation programme addresses common problems and causes for business failure: first, by selecting entrepreneurs

BOX 13: ACTION POINTS

The critical path in incubator development runs through securing the vacant building or land, finding the finance to renovate or build, and completing the construction work. If these activities are well in hand, the other implementation actions can run concurrently and the first clients can be selected and inducted within 9 to 12 months. The telescoping of these actions requires the following:

- Clearly delegate authority and responsibility for the construction management, setting realistic schedules and budgets; then, reward those responsible for meeting targets and penalize them if they don't.
- Set up the organization structure so that the TBI Board is made responsible for policies and high-level relationships, for promoting the incubator program and mobilizing finance, and for selecting the manager and overseeing performance – although with minimum interference in operations.
- Then, the working committees should be left to do their special tasks, and the manager enabled to do his/hers.
- As the selection of the manager is critical to the success of the entire program, seek out the best candidate through referrals, publicity and interviews.
- Once an entrepreneurial person is appointed, provide orientation in-country and hands-on apprenticeship training at a comparable incubator, and continuous retraining opportunities thereafter.
- Importantly, design incentives linked to performance of the management team, and a clear career-development path.
- Teamwork and compatibility between members of the Board, within the management team, and between them and the client companies are crucial for success. Many an incubator has suffered because the managers have clashed on territorial and personality issues. Keep in mind the axiom: ‘It is amazing how much can be achieved if you don't care who gets the credit!’
- Utilize the best possible (not necessarily the most expensive) resources to launch a media campaign for marketing the TBI. This starts with determining the incubator’s strengths and the needs of the target market, followed by activities that can satisfy the market and accomplish the objectives. Good news on the successes achieved – widely disseminated – is the most effective marketing tool.

The success of the incubator – and of its governance and management – is best measured by the survival and success of its clients, and by the satisfaction of the sponsors and the local community.
with better-than-average opportunities to achieve success; second, by developing a support programme to help them meet their needs and overcome their problems; and, finally, by constantly re-evaluating the changing requirements of its members and developing specific interventions.

Some causes of business failure
While an incubator cannot protect all businesses from the multitude of issues that confront them, it can address many of the common causes of failure. These, and corresponding approaches to remedies are as follows:

- **Inadequate capital**: Seek the requisite funds through a variety of debt and equity vehicles.
- **Product or service not needed**: Demonstrate market need as a precondition for entry into the incubator programme, and seek counselling on marketing.
- **Excessive overhead**: Secure space at flexible terms, reduce fixed costs.
- **Insufficient commitment from the owner**: Take guidance, and mentoring.
- **Poor understanding of business**: Enhance personnel and financial management skills, and seek alliances with national and international partners.
- **Poor accounting controls**: Enhance skills and take external support.

The business plan
Businesses seeking entry to the TBI should have a plan (or be helped to formulate one) in order to articulate their goals and consequent needs, and to compel the management team to face inconsistencies and provide missing elements, such as a financing strategy (See Annex 6 for a suggested checklist for assessing business plans). The plan need not be lengthy, but must be reviewed regularly and updated as circumstances dictate. Box 14 provides answers to some of the questions entrepreneurs may have about business plans.

With a completed business plan, the partners will understand each other far better. Employees can take actions consistent with the plan; investors can assess the risks and rewards of the investment and the incubator team can identify development difficulties and build a programme of business support. The plan provides: benchmarks to track performance, the means for assigning priorities, and the financial proposal for attracting investors, partners and employees. While these are good reasons for a plan, often only the need for financing will force an entrepreneur away from the daily problems to the often agonizing challenge of developing a plan.

The business plan – like a war plan – is only valid until the first battle starts. Once the venture has been launched and the parameters are better defined, a strategic business plan will be needed, together with annual operations plans to meet emerging challenges.

It is usually a mistake to have a professional, such as an accountant, prepare the business plan. Accountants will, by nature, focus on the financial aspects of the business, particularly the historical ones. It is important that the plan include significant input from the owners of the business. It starts

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**BOX 14: QUESTIONS ABOUT BUSINESS PLANNING**

Isn’t this for big companies only?
No, small companies need plans even more to sort out the inconsistencies and provide focus on areas critical to business success.

How does planning help management?
It helps focus scarce resources on critical areas and to obtain the necessary financing.

Can’t I hire someone to do this for me?
The plan is the embodiment of the concept of the entrepreneur. A professional can help, but the key inputs are required by the management team.

How can I know all the answers?
You can’t. But asking questions allows you to determine key needs for research.

How often do I have to do this?
As often as the business changes, probably initially once a year. (Typically, after gaining entry to the incubator and securing finance, you will throw the plan away!)

What’s in it for me?
Business success with reduced personal and professional stress (together with less pressure on your family and staff)!
with the customer’s needs, and leads to marketing, service and personnel issues. These drive financial aspects of the plan, which will define the growth path and the strategy needed.

**Tenant selection**

The selection of quality clients with a strong potential for growth sets a standard of professionalism that attracts others of the same kind. Is picking winners a legitimate purpose for a partially subsidized facility? The key is to accept those who can be helped to develop an enterprise capable of contributing to the economic growth of a community, and rejecting those who are involved in a flawed business concept, who do not have the capability to start and grow a business, and who will eventually hurt themselves and their community.

**Characteristics of entrepreneurs**

There is some confusion in the literature as to the definition of entrepreneurship, which is often considered as equivalent to running or starting a small business. Since entrepreneurship is a more glamorous and fashionable term, the tendency is to call all small-business owners entrepreneurs, and to change the title of courses and journals from *Small Business* to *Entrepreneurship*. Obviously, just calling the small-business owner an entrepreneur does not change the personality, outlook, experience, activities, and goals, of the person and the business. Similarly, calling a small business management course an ‘entrepreneurship course’ does not change the objectives, syllabus, pedagogical methods and outcomes of the course.

**Ongoing self-assessment**

Entrepreneurial characteristics are not always evident when a person launches an endeavour, but rather are often acquired over time with the challenges of building a successful business for the first time. These characteristics can be reinforced when the entrepreneur participates in a TBI programme and interacts with the management team and other entrepreneurs.

The incubator manager and the entrepreneur must assess the entrepreneurial attitudes of the key members of the business, on such issues, abilities and personality traits as the following:

- **Self-motivation**: Achievements in the past. What adversity have they overcome?
- **Achievement**: Determine how a person sets goals. Are they achievable?

- **Power**: Power needs can be destructive. Why the need for control?
- **Affiliation**: Need for acceptance, support and reassurance. Where can they get these?
- **Money as a reward, not a goal**: Why do they work? What are they trying to achieve?
- **Internal self-control**: Review business background. How have goals changed?
- **High-energy level**: Ask questions that reveal discipline and schedule. When do they start and end their workday?
- **Ability to get others to share their vision**: How do they motivate co-workers?
- **Controlled risk-taking**: What tough decisions have they taken on measured risks?

The incubator management team must help potential entrepreneurs determine if they have some of the key characteristics for entrepreneurial success, namely:

- drive and energy level, self-confidence, competing against self-imposed standards
- the ability to set challenging but realistic goals, long-term involvement
- the ability to pursue money as a performance measure, taking moderate risks
- perseverance in problem-solving, learning from failure
- the ability to take initiative and seek personal responsibility
- the willingness to make optimum use of resources and networks.

**Potential clientele**

Principal sources of entrepreneurs for TBIs would include the following:

- university graduates and researchers with public institutes
- SME support programmes and bank credit applicants
- retired government, military and corporate officials
- entrepreneurs from medium and large industrial plants
- professional service firms
- disadvantaged groups (including women, seniors and youth)
- those urgently seeking employment.
During economic downturns, as corporations cut staff, the need for self-employment is even greater, but market opportunities are fewer.

Tenant selection is especially important if the incubator has limited space available or is working with part-time staff. The Advisory Committee should include individuals from successful businesses, or from chambers of commerce, government, banking, and academia, who would review tenant applicants according to an agreed sequence and criteria. This committee could advise the incubator manager, who would then be responsible for the selection of clients, subject to overall agreement by the Board. However, should the Board interfere in this process (as boards tend to do for political reasons), it will becomes difficult to hold the manager responsible for the support given to the tenant.

A special concern in developing countries is to identify, prepare and select women-owned businesses for entry into the incubator. Setting quotas (e.g. that 30% of all incubator clients should be women) does not really help unless it is accompanied by serious measures to identify the unique problems they will face, along with special services designed for them, and by an effort to mobilize opinion to modify the cultural milieu, including the possibility of empowerment incubators focused on women entrepreneurs.

**Tenant selection process**

When an incubator seeks to ‘grow’ companies, it must have a selection process through which it evaluates and selects firms that are most likely to succeed. By what criteria will it admit companies into the incubator? How will the incubator judge success? When and under what circumstances will it ‘pull the plug’ on tenant companies? What exit policy exists, if any, and how does this apply to the selection of incoming firms? The tenant selection process is shown in Figure 8.

The majority of businesses are very small and employ only one or two persons initially. These micro-enterprises, often called *lifestyle* businesses, do not have significant potential for generating income and employment. Others generate good income and have the capability to become larger but prefer to remain small. Entrepreneurial businesses are typified by rapid growth – a big business that happens, at this moment, to be small. Microsoft and Apple Computers come to mind. These higher potential companies are the ones that the incubator seeks.

Applicants to the incubator should be required to submit a business/project plan and to complete an application form before final acceptance into the incubator. The business plan should generally covet the key elements in the TBI plan discussed earlier. A draft application form – to be adapted to the incubator’s needs – is shown in Annex 7. Temporary occupancy in the incubator can be arranged while the entrepreneur works with the incubator management team to develop a business plan.

**Selection criteria**

Criteria for tenant selection are on three levels, of which the most important are the business aspects:

**General**
- potential for business growth
- ability to create jobs
- ability to generate net profit and pay incubator rentals
- potential to strengthen and diversify the economy
- ability to increase local tax base
- understanding that the management resides in the community
- compatibility with incubator objectives and existing clients.

**Technical**
- value-added by innovation
- core competence
- time to market
- patent situation
- uniqueness of concept
- access to external expertise/faculty/facilities.

**Business**
- market knowledge and focus on specific industry
- people-oriented manager, able to attract a good staff
- ability to develop a network of cooperative relationships
- good communicator, with knowledge of English and computing
- small business management and marketing skills
- integrity and capacity for hard work
- ability to handle crisis and risk.
The Advanced Technology Development Center at Georgia Tech, Atlanta, Georgia, USA, utilizes a four-step process involving in-house experts to assess the management, and money and technology; and graduate students to assist in surveying the market. Criteria for evaluating entrepreneurial opportunities are given in Annex 8.

For a company with a potential for growth, a balanced team with experience in the business is preferred, since the range of experience needed to grow an enterprise rapidly is seldom found in only one person. The incubator will provide some of the skills necessary, and training programmes will augment capabilities. The incubator seeks individuals with good 'people skills', that is, the ability to work well with others, to delegate authority, attract a team, and develop a network of contacts.

The entrepreneur should know who the customers are and how to reach them. Ideally, the structure of the market should be one where no major competitors are already entrenched and where a large share of the market can be obtained. There should be high value-added and gross

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Figure 8: Tenant selection procedure
margins that are high enough to provide a cushion for mistakes that will be made. Competitive advantages for the product should exist such as legal/contractual advantages and proprietary protection through patents.

In the financial area, profit after tax and positive cash flow should be high as the business matures, while time to break-even should be low. The return on investment should be substantially above prevailing interest rates. Most tenant applications focus on the technology aspects of the business, to the neglect of the market and management. Careful checking of references, as well as interviews by successful business professionals, are important steps in ensuring that the entering class meets the goals of the incubator. Proactive recruitment programmes include referrals from successful professionals.

### Exit policy

While the entry policy is reasonably straightforward, the exiting process is complicated. The incubator is designed for the short-term support of growing businesses. It will be successful to the extent that it helps new enterprises enter the market, and also deals with flexibility and sensitivity with those who show no capacity to do so. To monitor the performance of all its clients, a monthly report from them is essential (see Annex 9), together with frank meetings and mentoring. When there are no subsidy rentals or services (or when the space is not fully occupied), there is less of a need to terminate a tenant’s occupancy.

Business development leads, in simple terms, to three alternatives: *Business closure, latent or survivalist business, and business success.*

**Business closure**, whether voluntary or involuntary, is an essential part of the business process. The incubator must deal with such closures humanely and in a manner consistent with the need to maintain a healthy environment. Failed businesses should be humanely and quickly removed, preferably before the news of the failure becomes public, so as to spare both the business and the incubator embarrassment and bad publicity as much as possible.

**Latent business** is the most difficult. Such businesses, sometimes referred to as the ‘living dead’, are identified through monthly monitoring and continuing discussions. Their business plan keeps changing as they encounter a series of setbacks, often attributable to sources outside the control of business management. As soon as this pattern of non-development becomes evident, the incubator management team must intensify the normal counselling, including advice on the quick closure of the business.

The UK experience on the traditional exit requirement is of interest. A business, now well established in the incubator environment, is allowed to continue in its space, provided it is viable and can pay its way. The TBI could sell such spaces to a professional realtor to be run as a multi-tenant facility, and build more incubation space. It also builds ‘progression units’ for those who do not want larger space but need somewhere to go.

A major challenge for the management team is to remove a successful business to make room for new start-ups. Under the pressure to maintain an income stream, the temptation to allow a tenant to remain is strong. Graduation guidelines are necessary but are not a substitute for understanding of the mission of the incubator.

Post-graduation support is appropriate to ensure continued strengthening of business practices. The incubator must maintain contact with graduates and compile information on their performance, which will be useful in evaluating the incubator.
Incubator management teams seek winners. This is a determinant of the high success rates of companies going through the incubator and also a cause for criticism of the modality. In setting entry and exit processes, boards must consider the imperatives of developing successful clients and of maintaining viable incubator operations:

- Word of mouth is the best promotion; therefore the first batch of clients should be selected with care so that a good start is made on building a reputation for success.
- As, typically, one in ten candidates may gain entry to the subsidized space and service, selection policies should be fair and be seen to be fair.
- A rudimentary business plan can be started in a pre-incubation workshop, and the client can then be assisted to complete it as a condition of proper entry.
- While money is usually on top of an entrepreneur’s litany of problems, in practice his or her biggest problem is an inadequate understanding of the potential market and of management practices. Capability to produce and to sell a quality product should receive serious attention.
- Whether structured or not, the selection process typically comprises: a group discussion in which the incubation process, and its obligations and benefits, are explained to prospective clients; then, an application is filled out; followed by interviews to assess the general suitability, the technology considerations, and, importantly, the business, management and marketing aspects.
- Just as important as the selection criteria are the graduation criteria, the monitoring–mentoring system that forewarns of emerging problems. The exit process is the most difficult for both the incubator manager and the business, requiring flexibility and sensitivity.

Both the entry and the exit processes start with the integrity and courage to resist any external pressures.
Serving tenant companies

Progression of services needs
The planning, establishment and maturity of a business incubator, as indeed of the businesses it nurtures, should be a continuum. In industrialized countries, the environment has a strong technological orientation, and the culture promotes curiosity and self-reliance, from school onwards through adult life. This is not so in most developing countries. Consequently the training, counselling and networking services to be provided by the TBI have to be responsive to this context and directed towards a seamless progression.

Typically, the Seven Services provided are in a pyramidal structure, with the more frequently used services at the base:

1. Services on legal and IPR issues
2. Seed equity capital sourcing and credit
3. Skills development, mentoring and counselling
4. Support on information, facilitation and networking
5. Synergy among clients through the exchange of experience
6. Shared office facilities and equipment, pre- and post-incubation
7. Attractive space that is functional, affordable, and on flexible terms.

The rapid progress of information and communications technologies (ICT) and the expansion of internet users and video-conferencing, are increasing the opportunities for training and counselling entrepreneurs over long distances. While such e-incubation can have merits in reaching larger numbers of entrepreneurs, reducing costs of physical facilities, and facilitating the learning process, it needs to be combined with face-to-face contacts to enrich the venture creation experience. Furthermore, possible differences in the cultural patterns and language require careful preparation of the content as well as of service providers.

Training for clients
Skills development on general topics can be done informally through consultations with the incubator staff, who – augmented by private and state-supported service providers – can assist the prospective clients. Due to initial lack of experience with, and limited time for, this task, staff capacity will need to be supplemented by external trainers and mentors for special subjects.

Entrepreneurship development
As entrepreneurial skills are generally inadequate in many developing countries, and as Entrepreneurship Development (ED) is not a subject taught in many school or university curricula, significant efforts are needed in continuously tutoring the client companies on the ED essentials, such as business strategies and management, keeping accounts and making financial projections. This should be done by people with practical experience.

Busy entrepreneurs are reluctant to absent themselves from their business for more than one day per week, and therefore such courses are best given on Fridays and Saturdays (with time off for religious observances). Courses should last all day, with theoretical instruction in the
morning, and practical work on business, financial, production and marketing plans, and so on, in the afternoon.

A series of short, formal training courses should be initiated, targeted at clients and those who may be considering starting a small business in the future. Courses could include:

- Strategic business planning
- Marketing strategy and exporting
- Team-building and partnering
- Production, supply chain and quality management
- Technology sourcing and IP protection
- Managing university and research linkages
- Internet and e-commerce
- Managing human resources
- Financial planning and budgeting
- Communicating skills and public relations
- Negotiating and interpersonal skills.

The courses could have a small business component, such as How to manage a successful business; an entrepreneurial component, such as How to recognize an opportunity and create a successful new venture; and a special technical focus, if needed.

The NxEvel programme for entrepreneurial support, developed by the University of Denver and US West, is administered by service providers. A typical course covers:

- Session 1: ‘Introduction: Overview and Entrepreneurship’
- Session 2: ‘Planning and Research: Entrepreneurial Essentials’
- Session 3: ‘Organizational Matters: Management and Legal Structure’
- Session 4: ‘Marketing – ‘Behind the Scenes’: Analysis and Understanding’
- Session 5: ‘Marketing – “On Stage”: Strategies, Tactics and Implementation’
- Session 6: ‘Financial Overview: Books, Records and Controls’
- Session 7: ‘Managing Your Money: Financial Planning, Budgets and Assumptions’
- Session 8: ‘Managing Your Money: Developing and Using Cash Flow Projections’
- Session 9: ‘Understanding and Using Financial Statements’
- Session 10: ‘Financing Your Business: Alternative Sources of Money’
- Session 11: ‘The Deal Making Process: Negotiating in the Real World’

**Counselling and mentoring**

A complete portfolio of advisory services has to be developed and the delivery customized to each segment of the incubator population. These services should generally complement those available outside the incubator, not compete with them. Some client personnel can be counselled by the management team in response to specific queries. General topics should be handled through expertise developed in-house, while others would need special inputs through networking with university faculty and external professionals. Still other clients could be assisted by the Board members.

Some of this counselling will be without a fee; work needing serious consultant time should be paid for by the tenant. Leading accounting and management consultants can be induced to contribute some days of pro bono work, on the basis that some of the clients will then engage their services in the future. Some prioritization of assistance is required, as incubator staff resources are limited. Furthermore, given the pace of technological change, the team can only cover a part of the potential needs.

A mentor by definition is a ‘wise adviser’, one who can impart, through informal association, some of the accumulated experience on practical matters. Board members and external professionals can be induced to spend some hours per month with clients on issues of marketing, know-how sourcing and accessing the supply chain.

Ideally, a group of mentors with specific skills can be identified and oriented; then, the client should have the opportunity of selecting the mentor of his/her choice, and rating the quality of help received, not vice versa. In many situations, it makes better sense to empower the demand side (and to subsidize it through vouchers where possible), rather than subsidizing the supply or service providers, as was the earlier practice of donors and governments.

An external consulting group may be given the responsibility of providing advisory services, or, in special cases, of providing the complete management of the incubator. Costs would be reduced if this group were to provide management
services to a hub and its satellite incubators. The need for professional liability insurance may have to be considered.

**Marketing assistance**

Since marketing is the key to the development of the business, especially in an era of 'customer focus', a variety of forms of assistance are needed; these range from strategy development to services such as desktop publishing. The incubator management team can help develop marketing strategy and provide an independent perspective on market segmentation, the prioritization of targets, pricing, advertising, and the alternative distribution and sales strategies.

**Technology services**

At US incubators, the services most in demand regard networking with external professionals, as shown in Table 15.

Research commercialization may require help in *technology ferreting*, that is, proactively identifying emerging results from a large research portfolio, and promoting their commercial use. Conversely, existing clients can be given access to a faculty profile of talent at universities in the neighbourhood, in order to find the expertise and research results they need. The incubator management team can assist in identifying technologies by publicly supported research, outside the incubator, through new online services that allow one to search, and retrieve information from, research databases. The role of selected US university-related incubators in promoting technology businesses is indicated in Box 16.

One service facility that is much in demand at the incubator in the Technology Park Malaysia, Kuala Lumpur, is the *rapid product prototyping* unit, which can create precision components to meet tenant specifications. The Hong Kong Industrial Technology Center (with a focus on multimedia, telecommunications, microelectronics and software) provides a machine shop, network test-bed and measurement facilities to its clients. While conventional mixed-business incubators provide the software for development (training, counselling and networking), technology-focused clients can benefit from the use of shared hardware (testing, prototyping, clean rooms, wet labs, distilled water, etc.). Management teams in technology incubators need to establish new, in-depth programmes, to keep pace with rapidly changing technology development.

On the legal side, the services needed at a TBI – in addition to company incorporation – include facilitating know-how licensing agreements, patent reviews, intellectual property protection and non-disclosure procedures. Such special work is mostly done on a referral basis.

**Informal networking**

Informal networking takes place at all times when the management team and clients get together in the conference room, during coffee breaks, near copying machines, and so on. The layout of the incubator and open doors should encourage and facilitate this process. In addition, organized networking has proven to be very beneficial. This could be organized at breakfast or lunch seminars (see Box 17). One way would be as follows: every participant is given a colour-coded name tag, with different colours indicating whether the wearer is in the incubator

<table>
<thead>
<tr>
<th>Consulting faculty/students</th>
<th>Yes, direct</th>
<th>Yes, by referral</th>
<th>Both</th>
<th>No, rarely/never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organize access to external facilities</td>
<td>51.9</td>
<td>30.8</td>
<td>13.5</td>
<td>3.8</td>
</tr>
<tr>
<td>Locate key technical staff</td>
<td>62.7</td>
<td>15.7</td>
<td>17.6</td>
<td>3.9</td>
</tr>
<tr>
<td>Use databases, if researchers</td>
<td>27.5</td>
<td>45.1</td>
<td>21.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Finance research and development</td>
<td>46.0</td>
<td>34.0</td>
<td>12.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Source: Tornatzky et al. (1996)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Advanced Technology Development Center (ATDC) at the Georgia Institute of Technology, Atlanta, Georgia, and the Ben Craig Center (BCC) at the University of North Carolina, Charlotte, are among the best of the 50 or so US university-related incubators.

ATDC started in a renovated high school in 1981 and moved to a new building in 1984. It operates the Entrepreneurial Services Programme for moving technologies to the market, as well as faculty research and corporate research programmes. ATDC now reports to the Georgia Tech Economic Development Institute, which reports to the president of Georgia Tech.

The incubator focuses on early-stage, research-based companies with technologies of a proprietary nature. It has developed a four-step due diligence programme of interviews and reviews to select growth-potential applicants. The main facility (7,700 m²) has 29 companies, with an additional 20 companies at the branches. There have been 29 graduates (up to 1996):

<table>
<thead>
<tr>
<th></th>
<th>Members</th>
<th>Graduates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies</td>
<td>49</td>
<td>29</td>
<td>78</td>
</tr>
<tr>
<td>Revenues (US$ million)</td>
<td>13.4</td>
<td>252.4</td>
<td>265.8</td>
</tr>
<tr>
<td>Employment</td>
<td>227</td>
<td>1,910</td>
<td>2,137</td>
</tr>
</tbody>
</table>

The average jobs come to: 5 jobs per member company and 65 in graduates. The average revenues are US$300,000 for members and $8.7 million for graduates. From a state expenditure of $20 million since 1981, some 2,100 jobs have been created, together with other promotion functions for the state of Georgia. The benefits for companies at ATDC are essentially an increased credibility and access to facilities through proximity to a renowned institute.

BCC, Charlotte, North Carolina, is a non-profit corporation supported by the public University of North Carolina Foundation. The incubator is in a well-designed, US$3.5-million building (5,000 m² of space, see layout in Annex 4). It has 24 clients and 6 graduates. The bulk of the clients are in technology services (41%), and software (24%), with the remainder in instruments, chemicals, and electronics. BCC also has an affiliates programme and a Small Business and Technology Development Center. Since 1986 it has assisted 130 companies.

The university services most valued were student employees, faculty consultants, the library and the laboratory. So were the typical incubator services, such as accounting, marketing and business plan preparation. BCC actively promotes its international activities with a campus in Germany.

At BCC and ATDC, the sponsors and clients both valued the positive contributions the incubators were making to their respective objectives. Both incubators continue to operate on significant subsidies, without any apparent need to become financially self-sufficient.

The University of Central Florida at Orlando is a good example of cooperation between the university’s research programme and its technology incubator. The incubator, with its 70,000-m² space, is an integral part of the research commercialization process. Regular meetings between the two help to identify work that has potential for rapid technology transfer, suggest university resources that are available to a new venture, and identify the potential market and the management team. The incubator’s current clients hold 285 patents, employ 400, and have revenues totalling $100 million.

Sources: Culp and Shapira, 1997; Mian, 1996; Mark Schaffner, 1999.
management team, or a client, private company, banker, government official, ‘angel’, and so on. During the networking period, people have the opportunity to take the microphone, to introduce themselves, and to present their problem or offer any assistance. At the end of the introductions, those with common interests contact each other, exchange cards, and provide information and advice. Networking is also a good way for community leaders to become involved with the TBI and its clients.

Finance for clients

A variety of financing sources is necessary to meet the evolving needs of companies. Often, the management support that a small business receives with an investment by a skilled investor is worth significantly more than the money. Beyond the formal sources of funding (see Table 16), the incubator staff can help access ‘factoring’ services (selling of accounts receivable), short-term working capital loans, contacts with venture capital and private investors (angel networks), and other sources of finance and support. Obtaining capital on appropriate terms requires prior planning and development – often more than a year in advance.

Many financing options exist for entrepreneurs, from private sources through banks to friends, family and ‘angels’. Each has its own requirements, both formally and informally, ranging from appropriate loan amounts, application procedures and collateral. Knowing these requirements is the basis for determining ‘gap-filling’ financing strategies. A venture should not be supported without a clear programme for subsequent financing; to proceed otherwise raises the significant risk of growing a business into failure.

There is a misconception that venture capitalists and ‘angels’ finance most small businesses. In practice, the sources in the USA are: owner equity (27.1%), equity from friends and family (15.4%), bank loans (19.9%),

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**Box 17: Informal Networking**

Some essentials of informal networking are as follows:

- Come prepared with business cards, a pen and a small notebook. Know what you want to accomplish at the event. Develop several different ways to start a conversation. Exchange business cards and make notes on the back of the cards.
- Know how to describe your business in one or two sentences. Be positive, friendly, enthusiastic, and act as if you are the host, not a guest. Don’t be afraid to approach people. Strangers are friends you haven’t met yet.
- Try to spend no more than ten minutes with each person you meet. Listen more than talk. You have two ears and one mouth; use them in that proportion.
- Practice your ‘elevator pitch’, that is, the focused statement to attract attention to your work within the few minutes that you have a captive audience in an elevator trip.
- Follow up promptly with the people you meet and the contacts they give.

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Table 16: Notional stages of business capitalization

1. **Pre-seed or Embryonic**
   - Credit cards, private investors, personal savings
   - Family and friends
   - Typically, US$5,000–$30,000

2. **Debt and Equity, including convertible instruments**
   - Loan and equity funds
   - Bankers and investors
   - Private and government loan guarantees
   - Private investors (‘angels’)
   - US$100,000 to $1 million

3. **Venture Capital**
   - Venture capital funds
   - Supplemented by commercial credit
   - US$3 million to $20 million

4. **Strategic Alliances/Partnerships**
   - Joint ventures
   - Investors
   - Partnerships
   - Customer/supplier credit
trade credit (17%), other debt sources (15.4%), and then ‘angels’ (4.9%) and venture capital (2.4%). In the USA, venture capital disbursements rose sharply in the year 2000 to almost US$10 billion, with a decline in 2001.

Restrictive conditions on debt financing at some state-sponsored schemes, including targeting capital equipment at the sacrifice of working capital, implicitly constrains the development of technology businesses.

**Funds within the TBI**

The major uses of capital are:

- **working capital**: to finance payroll, materials and small equipment
- **equipment leasing**: to fill orders or produce goods for expected sale
- **fixed asset financing**: to finance large or heavy equipment and facilities
- **new product development**: to finance prototypes, test marketing, pilot production, and the like, prior to full-scale marketing and production.

Fixed asset financing is provided through long-term debt, because equipment can serve as collateral and facilities can be mortgaged. Capital to develop new processes and products is the most risky. Such pre-venture financing is best obtained through government R&D project grants, but sometimes with equity capital.

The major need among new or early-stage enterprises is for working capital. Entrepreneurs usually start their businesses with seed capital, obtained from personal savings, relatives, friends and associates. Then, because such young companies have not been in business long enough to develop a ‘track record’ or a bank line of credit or sufficient assets, they are not bankable. When they inevitably come to a point where they need working capital for any purpose, they cannot borrow. This can severely limit the growth of a young enterprise. Incubator managers, therefore, should give priority to the provision of working capital.

An **in-house fund** for incubator clients could be established so as to provide various types of capital on flexible and negotiable terms, following two basic goals:

1. **Helping, not harming, the enterprise**: It is possible for financing to undermine rather than help if, for example, it is in the form of a loan with high fixed payments that jeopardize the business when an economic downturn occurs, or of equity that is not structured to allow follow-up equity financing.

2. **Assurance of payback from the investment portfolio overall**: Clients and their financing should be viewed as a portfolio of investments, not just one at a time. It is unrealistic to expect full payback from each enterprise, but one must manage so that all funds provided, plus the allocation for expenses and interest, are recovered within, say, five years.

The major types of capital which an incubator fund should be prepared to provide to entrepreneurs are:

- **debt** (short-term loans as working capital)
- **equity** (venture or ‘seed’ capital)
- **near-equity**: debt on flexible terms, including delayed initiation of repayments, and debt convertible to equity
- **royalty financing** (payback on the basis of 5%–10% of sales).

**Revolving loan fund**: An appropriate way to provide working capital is through short-term loans (usually 90 days, up to a maximum one-year term), possibly through a revolving loan fund. Revolving means that as old loans are repaid, the funds are recycled by making new loans, or, more conventionally, draws against a fixed commitment are repaid within a short period of time, with an interest rate determined by the average balance outstanding. Interest rates should be at or near market rates. In addition, a premium of one to five percentage points should be added in order to establish a loan loss reserve within the fund. Loans would be originated by the incubator manager and approved (or disapproved) by a loan review committee established by the Board of Directors.

**Royalty financing**: It may be desirable for an incubator to establish a royalty-financing fund for two purposes:

1. financing those support services to clients that are not paid for by subsidies or by fees from paid services
2. providing capital for technology business development or major expansion.

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4 Off road capital / Federal Reserve National Survey of Small Business Finances.
The payback to the fund would be on the basis of a percentage of enterprise sales. The percentage (most likely in the range of 4%–10%) would be negotiated between the incubator manager and the entrepreneur seeking financing, so that the incubator could obtain a payback of, say, 200% of financing within five years. The agreement should include a provision whereby the entrepreneur can ‘call’ or pre-pay the payback commitment by providing cash, equity, conversion to a loan, or some combination of these. Royalty financing commitments would be made largely on the basis of entrepreneurs’ business plans.

By placing funds that have been raised to support entrepreneurs’ needs on deposit in a local commercial bank, these funds might also be employed to induce the bank to provide loans to clients or to guarantee a portion of such loans. These funds should be professionally managed in separate accounts from those for incubator operations. The committee to review financing applications should include individuals with enterprise development, business financing and accounting experience.

Finally, it is important that an incubator manager establish payback monitoring procedures and collection techniques. Monthly due dates for loan repayments should be monitored for all loan recipients, and the creditors should be called if there is more than a week’s delay in expected payments. Royalty payback needs to be monitored though monthly operating statements showing the total sales per month, confirmed by annual professional audits, with penalties assessed on late payments. The incubator manager is in a strong position to obtain repayments from clients, as he is the one who negotiates their leases and is fully involved with their operations.

Seed capital funds: Risk capital networks are becoming a mechanism for bridging the capital gap between the entrepreneur’s own resources and the more traditional sources for second- and third-round financing such as banks and venture capital firms. The manager should maintain a list of possible funding sources, both for the incubator and its clients. It is important that the potential lenders be kept advised of the ongoing activities in the incubator. The more successful the incubator, the more likely it will receive favourable treatment when funding is requested.

To the extent that an incubator is well financed, it has money that it can invest in serving its enterprises; and when the latter are well financed, they are in a better position to pay rents and fees to the incubator.

### Intellectual property protection

An intellectual property (IP) portfolio comprises a variety of creations of the human mind, in science, technology, services and the arts. Intellectual property management is a group’s capacity to claim ownership of its innovations and to exploit them. They can be a source of significant value, of protection against rights infringements, or of losses when not handled properly.

Typically IP covers:

- **patents**: granted by the government for an invention, that is, a new or novel solution to a problem
- **trademarks**: a distinctive sign that identifies a product or service that allows a consumer to distinguish this from competing goods
- **copyrights**: for a literary or artistic work, and related rights for performers
- **industrial designs**: legal right to protect an original or aesthetic aspect of an article
- **trade secrets**: information that is valuable to its owner, who has made efforts to keep it secret.

Various aspects and types of inventions are covered by different sections of the patent code of a nation. IP comes under the Berne and Geneva Conventions, which most countries have endorsed. The World Intellectual Property Organization, a UN body based in Geneva, deals with IP issues and promotes their protection and use, with training opportunities for small business and innovators.

Clients in technology and business incubators are developing and commercializing innovations through the processes of basic/applied research, pilot production with feedback from users, and on to entry into competitive markets. A majority, especially in developing countries, have not seriously considered protecting their innovations, because they may consider them of little value or not yet fully developed, or more likely, do not know how to get the relevant information and help.

The efforts involved in the IP protection process, the long application time, the disclosures, and the costs, can be serious obstacles. Many technical considerations are involved in deciding whether to patent or not – defensively or offensively – and in which countries, the research on existing patents relating to the innovation, the size and readiness of the market for the invention, and the potential ability to produce the product at the needed scale and cost.
The incubator management team has to know basic IP concepts, provide conceptual guidance on the above issues, and help clients to access expert legal advice through referrals; but clearly should not be giving recommendations for which the client may hold the incubator responsible later. The manager needs to recognize the legal ramifications, the confidentiality obligations regarding information on clients, and to develop a relationship with an attorney who can help – perhaps initially on a pro bono basis (See Krizmanic, 1995).

In the biotech and biopharma fields, it is increasingly important to protect IP rights and minimize risks to products and processes. Access to drugs for diseases prevalent in poor nations, and protecting those nations’ traditional knowledge and bio-diversity, have become critical concerns.

In this context, the recently established Center for Management of Intellectual Property Rights in Health Research and Development (MIHR) aims to provide a one-stop IP management facility for the developing countries. This Rockefeller Foundation-supported initiative provides IP-management training and expertise to universities, technology transfer offices and medical research councils working on patents for the diseases of the poor. It plans to work as a technocratic and apolitical body. The jury is still out on the effectiveness for the developing world of the World Trade Organization’s Agreement on Trade-Related Aspects of Intellectual Property (Trips).

The report of the UK Government-sponsored Commission on Intellectual Property Rights (September 2002, http://www.iprcommission.org/) makes important recommendations on the impacts of IP, both negative and positive, on those nations that have significant scientific capabilities (including some in the developing world) and on those that do not. It points out that:

IP rights are granted by states for limited time whereas human rights are inalienable and universal.... But describing them as rights should not be allowed to conceal the very real dilemmas raised by their application to developing countries, where the extra costs they impose may be at the expense of the necessities of life for poor people.

Real estate management

Real estate management is the administration, operation, marketing, and maintenance of real estate. The goal is the management of the property as an investment; this will not ensure success, but it can contribute to failure.

The property manager always has an eye towards long-term appreciation of the property, as well as short-term cash flow. The manager follows a plan that governs all aspects of the physical plant, financial operation, tenant relations, market positioning, and community image-building. He is directly responsible for maintaining and creating value in properties, by improving the net operating income, which is accomplished through efficient procedures, optimization of rental income and improvements.

Maintenance philosophy could be to maintain the TBI in such a manner as to: provide a safe, clean environment for the clients and visitors; ensure, through maintenance and planning, that the facility operates efficiently and economically; and ensures that the appearance of the building and grounds is in keeping with the successful image the incubator wishes to project to the community.

With a limited budget, the manager must carefully deploy resources to ensure that the physical condition of the facility neither inhibits the mission of the incubator nor becomes a black hole for limited resources. In general, like the member firms, the facility must be clean and functional, requiring the activities outlined in Table 17.

Space allocation: Ingenuity must be used to ensure that maximum revenues are obtained from every square metre of the facility. A full incubator raises a number of questions, including:

• Should some members be ‘graduated’ to make room for new members?
• How will the needs of expanding members be accommodated?
• Should additional facilities be explored?

An incubator with a low occupancy rate raises a different set of issues, such as: what are the problems in the operation of the incubator that reduced the demand for space? How can the deficiencies in the marketing programme be rectified?

Leasehold improvements: Special needs of a tenant may require a different layout and size of space, or additional utilities and facilities. Modifications may be made by the incubator to suit client requirements, with costs shared with the client. Or the tenant may make the necessary changes in return for concessions in rent.
Table 17: Maintenance/operations activities

<table>
<thead>
<tr>
<th>Physical Operations</th>
<th>Facilities Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Janitorial</td>
<td>Daily repairs and maintenance</td>
</tr>
<tr>
<td>Preventative maintenance</td>
<td>Security</td>
</tr>
<tr>
<td>Grounds maintenance</td>
<td>Facility inspections</td>
</tr>
<tr>
<td>Improvements</td>
<td>Space planning</td>
</tr>
<tr>
<td>Finance, budgets and accounting</td>
<td>Market surveys</td>
</tr>
<tr>
<td>Capital expenditure budget</td>
<td>Accounting procedures</td>
</tr>
<tr>
<td>Rent rolls</td>
<td>Purchasing</td>
</tr>
<tr>
<td>Long-range financial projections</td>
<td>Rental commissions</td>
</tr>
<tr>
<td>Marketing and leasing space</td>
<td>Marketing programme development</td>
</tr>
<tr>
<td>Space analysis</td>
<td>Establish tenant improvement</td>
</tr>
</tbody>
</table>

BOX 18: ACTION POINTS

Once the clients have been selected and the incubator starts operations, the challenge for the management team is to organize a portfolio of support services for helping the start-up firms to take their product to market, and to graduate from the incubator:

- Capacity-building, particularly on entrepreneurship and management skills, is a priority, as scientists and engineers may lack the essential business skills.
- Based on the portfolio, customized services have to be developed for different segments of the clients to meet specific needs, which can vary widely. The services have to be practical and affordable.
- Counselling and mentoring, reactive and proactive, is required on issues such as marketing, accessing external expertise and facilities, sourcing databases for information on trade and technology, protecting intellectual property, financial management, and recruiting staff.
- Counselling and mentoring can be provided in part by incubator staff directly, or through referrals, informal and formal arrangements by networking with selected professionals. Some counselling and mentoring services may well be on a pro bono basis. The care and feeding of the knowledge network has to be a priority of both board and manager.
- A recurring task is to help the firms secure the finance needed – seed, debt and equity. As the client-firm reaches maturity, venture capital becomes an option, including electronic access to angel financing.
- The TBI itself could initiate in-house financing mechanisms such as a revolving fund, equity in tenant companies, royalty arrangements, and a match-making service to link its clients to potential angel networks.
- In addition to being services-focused, the management team has the responsibility of creating a spirit of camaraderie, and a creative and cooperative environment for clients and staff.
- In the initial years, while incubator operations are being ramped up, services such as preparing business plans and training on IT applications can be offered to outside businesses, small and large. This can help build reputation and generate income. But a balance has to be kept, recognizing that the incubator should not ‘crowd-out’ external service-providers, and that the primary target groups are the selected clients within the incubator.
Enhancing and assessing performance

While national budgets for supporting small enterprises decline, the need for targeted services to help generate employment, innovation and entrepreneurship is rising. Operations of technology incubators as well as other business development services are now being reviewed. Special measures are being devised to enhance their performance, and more rigorous assessments are made of their financial sustainability.

Good incubator management

All societies have small enterprises, but the kind of entrepreneurship to be supported by a TBI is that which creates a business with a reasonable potential to achieve some scale. Forming a link between mercurial entrepreneurs and established business, government, and university communities creates continuing stress at high levels. Since entrepreneurs are emotionally and financially engaged in their business, the manager must act as their mentor and guide to identify problems before they emerge, and to help.

Why do incubators fail? Generally for the same reasons as their client-ventures. These include: undercapitalization, inadequate preparation, poor understanding of the entrepreneur’s availability and needs, weak linkages, poor location and layout, and bureaucratic operating practices. TBI performance has to be constantly monitored through a system of staff meetings, based on regular reporting.

Operation challenges

Once operations are underway, the manager is required to be a successful business executive, with broad technical and political experience and sensitivity. But he or she is frequently underpaid and has no identified career path. Recent data for US incubators indicate that 46% of incubator managers earn a gross annual salary of under US$60,000, 31% earn between $60,000 to $100,000, and 23% earn over $100,000 (NBIA, 2004). Salaries in developing country incubators are considerably lower, but staffs are larger.

The Board must recognize the imbalance between the demands made on managers and their salary levels, and develop its own programme for management support and incentives linked to performance. The inherent stresses of incubator management are reflected in managers’ reports of insufficient time for handling the myriad of tasks that occupy each day. Management problems range from intervention in intra- and inter-firm personnel conflicts, to the pricing of services and ensuring security.

The role of management includes the challenge of collecting payments and debts. Incubators that tolerate overdue accounts run the risk of turning the facility into a home for hobbies and failed businesses. Reactive tactics include late payment charges in terms of a fixed-charge penalty and daily interest at market rates for unsecured personal debt. Proactive approaches include ongoing monitoring of member operations, including of their financial statements.

Even successful businesses go through periods of cash deprivation, while others may be habitual defaulters. The manager’s task is to deal in a fair manner and to recognize potential problems before the bad debts imperil the financial health of the incubator itself. The challenges faced by a manager, on the negative side, may include dealing with theft and dishonesty, as well as marital difficulties such as clients moving into the incubator because they were evicted from their apartment.

The success of the incubator requires the development of extensive contacts in the community. These would include successful business professionals, government officials at all levels, educational institutions, and service providers (e.g. accountants, attorneys, consultants). Maintenance of a good network requires skill in providing the reciprocal value that is the essence of relationship development.

As noted earlier, to be effective, the Board must be drawn from a number of organizations, from government to entrepreneurs, each with a different culture and expectations. Significant time must be devoted by the incubator management team in developing and maintaining a healthy relationship with the Board members. This results in a mutual understanding of different perspectives, without compromising basic goals.

While ‘marketing’ may be viewed as newspaper articles and advertisements, the successful incubator will emphasize the personal, hands-on process of determining and meeting the needs of entrepreneurs, which is the best form of promotion. Creativity on the part of the manager will allow him or her to extend a modest marketing budget by becoming an effective spokesperson for the entrepreneurial process and by aggressively developing opportunities for free publicity for the incubator programme.
Monitoring performance

Monitoring performance of both the incubator and its ‘incubatee’ begins with the monthly operating reports. These provide a summary of the operational and financial characteristics of each tenant and of the incubator itself. Careful review of the monthly report is the basis for characterizing the activities of each venture as well as its development through time. Based on the analysis of the reports compared to the original business plans, observations of deviations from the plan should be the basis for discussions about potential corrective actions.

The tenant business plan provides the baseline for determining exit criteria. On the one hand, ‘graduation’ is an ‘exit’ based on the success of the business beyond the ability of the incubator to accommodate its growth. The tenant and incubator management team jointly develop plans for the business to relocate.

However, ‘graduation’ is not the only basis for exit from the incubator. Failing businesses need help from the management team in identifying the causes, while accepting that failure is a natural (and essential) part of a free market system. Prolonging an obvious failure only results in the dissipation of waning resources.

A checklist for monitoring member performance is given in Annex 9. The monthly report on the tenant allows not only for the reporting of income and expenses, but also for the self-report of services received from the incubation process. With this report and the evaluation it provides, the incubator management team, including the Board of Directors, has fundamental data for programme assessment. The progress of clients has to be monitored and assessed systematically, based on their specific goals as well as the overall objectives of the incubator. This could be done in a monthly meeting, to help identify problems before they cause damage, to mobilize timely assistance, and to prepare for the exit process.

Poor business skills among client ventures can be rampant, and their remediation must be handled aggressively, with consideration for the roles of the parties. Problems range from the treatment of staff to product pricing, from honesty with customers and suppliers to prioritizing a specific aspect of business operations to the neglect of critical aspects. Genuine and continued interest in each member is the key to this monitoring and support.

The manager must visit clients regularly, realizing the truth of the country saying that, ‘crops do not grow on land that does not feel the shadow of the owner.’ Good practices are outlined in Box 19.

Enhancing financial sustainability

A large proportion of incubators worldwide depend on some form of external support, which may be called social venture capital or just plain subsidy. The EU-supported Benchmarking Study asked the question: If the incubator stopped receiving cash subsidies, what would be the effect on operations? The responses indicate that, if external subsidy stopped, almost 60% of European incubators and over 36% of US incubators would have to reduce activities significantly or stop altogether (see Table 18).

As support budgets decline, incubators are increasingly being required to generate the bulk of revenues internally,

<table>
<thead>
<tr>
<th>Financial Sustainability</th>
<th>Europe</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>(1) Activities could be maintained at current levels</td>
<td>6</td>
<td>7.7</td>
</tr>
<tr>
<td>(2) Activities would have to be reduced significantly</td>
<td>31</td>
<td>39.7</td>
</tr>
<tr>
<td>(3) Incubator activities would stop altogether</td>
<td>17</td>
<td>21.8</td>
</tr>
<tr>
<td>(4) Not relevant – incubator does not receive subsidies</td>
<td>9</td>
<td>11.5</td>
</tr>
<tr>
<td>(5) No Response/ Blank</td>
<td>15</td>
<td>19.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>78</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

towards a greater level of self-sufficiency. A good measure of their performance is the capability to reduce dependency on external largesse, while meeting the objectives of their sponsors, the support needs of their clients, and the expectations of the community.

Products and services have to be priced at a level in excess of the full cost of supplying them. The incubator management team must establish costs as well as prices for each service and product offered. Monthly analyses of volumes and profits of each service/product provide an opportunity to continually assess the value of the offering, since the needs for services change as clients mature and new ones arrive.

### Assessment framework

As business incubation programmes are a fairly recent phenomenon, the history of incubator evaluation is similarly short, beginning in the late 1980s with studies by Campbell and Allen (1987), Allen and Weinburg (1988) and Campbell (1988). These initial studies evaluated incubation largely in terms of the number of new jobs created and the success or failure rates of incubated businesses.

Early attempts to evaluate incubation in terms of costs and benefits include a 1990 study in the State of Michigan by Thomas Lyons and a 1992 Ph.D. dissertation by Mark Rice. In 1995, Markley and McNamara published

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**BOX 19: GOOD INCUBATOR OPERATION PRACTICES**

According to NBIA, incubator operations should:

1. Concentrate on the development or collection of support services that nurture start-up or emerging businesses. Providing below-market rental rates should not be the primary focus of the incubator.
2. Value the growth and development of individual clients beyond their ability to pay rent.
3. Be judged on their ability to create new businesses or help nurture emerging companies, not on the number of jobs directly created. Successful growing businesses will create employment opportunities.
4. Be structured so that the property element takes a secondary position relative to programmes, since serving businesses is the core of quality incubation programmes. However, the facility can offer the following tangible and intangible benefits:
   a. a positive cash flow resulting from successful incubator facilities management,
   b. a centralized place for entrepreneurs to meet,
   c. a focus for small business support programmes in the community, and
   d. opportunities for valuable interchanges among entrepreneurial firms.
5. Be viewed as one component of an integrated overall regional economic development plan, and be designed to reflect the strengths and weaknesses of the region.
6. Be designed so that programme outcomes match both the short- and long-term benefits required by sponsors.
7. Work from a clear mission statement with quantifiable goals and objectives tied to an evaluation process rewarding quality performance.
8. Be run by highly skilled, street-smart managers who are willing to wear a large number of hats, e.g. those of: general business counsellor, triage nurse, facilities manager, psychologist and investment banker.
9. Recognize the inevitable tension faced by the manager who functions as both advocate for the companies and landlord of the facility.
10. Set up and run operational policies and systems in a business-like fashion.

*Source: NBIA Regional Training Institute*
an analysis of the economic and fiscal impacts of two US incubation programmes on their local and state economies, taking into account the economic activity generated (sales, payroll, cost of goods, taxes paid, etc.) as well as secondary benefits in terms of jobs and income as a result of multiplier effects in the economy.

A study by the Southern Research Council focused on best practices and tools from fifty incubator programmes (Tornatzky et al. 1995). Safriz Mian (1997) has proposed a model for assessing university technology business incubators in terms of an ‘integrative framework’ that examines programme sustainability and growth, tenant firms’ survival and growth, and contributions to the sponsoring university’s mission. Incubator managers cite the most important measures in evaluating performance as: numbers of jobs created, clients served, and companies graduated (NBIA 10th Anniversary Survey, 1996).

**Approach to benefit–cost assessment**

Good measures of performance of an incubation system are the medium-term benefits accruing to small businesses, sponsors, local community, region and nation (see Figure 9). The overall system benefit–cost assessment requires that donors make provision for – and pursue – the collection of the needed information by the management team on firms in the facility and those that are leaving.

The parameters and time-horizon of sustainability for all business development services (BDS) systems has yet to be properly defined. Ideally, the effects of a particular mechanism need to be isolated from other external fac-

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**Figure 9: Assessment of impacts, effectiveness and sustainability**

![Diagram showing assessment of impacts, effectiveness and sustainability]

**Table 19: Assessment of impacts, effectiveness and sustainability**

<table>
<thead>
<tr>
<th>I. Impact/Outreach</th>
<th>II. Effectiveness</th>
<th>III. Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enterprises created</td>
<td>7. Employment per net $ subsidy</td>
<td>13. Revenue surplus (6 years)</td>
</tr>
<tr>
<td>2. Survival rate of enterprises</td>
<td>8. Taxes paid per net $ subsidy</td>
<td>14. Services cost recovery</td>
</tr>
<tr>
<td>– in graduated firms</td>
<td>11. Disadvantaged groups helped</td>
<td>17. Tenant satisfaction</td>
</tr>
<tr>
<td>– indirect jobs</td>
<td>12. Incubator expansion</td>
<td>18. Changes in culture</td>
</tr>
<tr>
<td>4. Entrepreneurs reached</td>
<td></td>
<td>19. Enhancement of skills</td>
</tr>
<tr>
<td>5. Replication of ‘pilot’ model</td>
<td></td>
<td>20. Leveraging state policies</td>
</tr>
</tbody>
</table>
tors. Further, the performance of a group inside the facility could be compared with that of a comparable external group. Such assessments have seldom been made, as the definitional and data-collection tasks require time and money – both in short supply with incubator managers.

Criteria for measuring the incubator’s future progress could be set out starting at the business-planning stage itself. This helps in evaluating performance as well as in designing incentive packages to motivate management staff. Performance indicators could cover the following loops:

- **Efficiency of incubator operations**: Number of firms assisted with different services; number of clients in the incubator and employees/tenant; occupancy rates; exit rate of clients; and the evaluation by clients of management and services.

- **Sustainability**: Compared to business plan projections for actual income per year, actual expenses per year, years to break-even, and years to show cumulative surplus; match of clients to entry and exit criteria; enhancement of real estate value; number of graduating and failed firms over given years; and the evaluation by sponsors as well as clients of incubator effectiveness.

- **Impacts – social and economic**: These include direct and indirect jobs created by incubator clients; added value of tenant firms; research commercialization; utilization of university/laboratory staff and services; specific services to disadvantaged groups; increase in tax base; growth of regional economic activity; and non-quantifiable benefits such as the enhancement of entrepreneurship and more supportive government policies towards small businesses. Furthermore, the outreach effects and the replicability of the TBI programme to other regions are of interest.

### Rapid assessment of two TBIs in Brazil

On behalf of UNDP, a study was undertaken in 1999 using a rapid assessment methodology of two technology incubators (Lalkaka and Shaffer, 1999). The characteristics of the Biominas at Belo Horizonte, Minas Gerais State, and ParqTec in San Carlos, Sao Paulo State, are shown in Table 20.

Biominas and ParqTec are sponsored through partnerships with the government at the city, state and federal levels, and with local universities, research institutes and the private business. Both were developed on local initiatives with significant national support. The sponsors have contributed financially and continue to be actively involved in supervising the operations and mentoring the tenant-businesses.

Assessments of incubator performance are hampered by difficulties in obtaining investment and operating cost information, either because these are not available, or because the incubators consider such data as confidential. In both cases here, the management teams made special efforts to present the data requested. The evaluation methodology in this study uses a combination of qualitative description, quantitative analysis, and stakeholder perceptions. The stakeholders interviewed for this purpose were the public and private sponsors, as well as the incubated enterprises themselves.

As ParqTec has been in operation at its present location since 1990, it had more results to evaluate compared to Biominas, which has been operating only since July 1997 in its new permanent facilities. An approximation of the 1997 estimate of public capital and operating subsidy for ParqTec, and of the personal and corporate taxes payable, is shown in Table 21.

The subsidy per job should decline at ParqTec as more technology-based firms graduate and continue to expand, and as additional incubator space becomes available. For mixed-use incubators, which typically have much larger areas, the subsidy cost per job can be much lower. Furthermore, while investment is made once, jobs continue.

To summarize, the ParqTec and Biominas incubators studied have had impacts on their respective city and state economies in nurturing entrepreneurs and creating sound enterprises with good survival rates. ParqTec has generated employment with a public subsidy of around US$3,258 per job, without including jobs in affiliates. Estimated return in the form of taxes could be about US$6 per dollar of public subsidy.

### Table 20: The Biominas and ParqTec facilities

<table>
<thead>
<tr>
<th></th>
<th>Biominas</th>
<th>ParqTec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of operations</td>
<td>1997</td>
<td>1990</td>
</tr>
<tr>
<td>Building</td>
<td>custom-built</td>
<td>renovated</td>
</tr>
<tr>
<td>Gross area (m²)</td>
<td>2,850</td>
<td>1,417</td>
</tr>
<tr>
<td>Rentable area (m²)</td>
<td>1,080</td>
<td>550</td>
</tr>
</tbody>
</table>

*Source: Business & Technology Development Strategies LLC*
The benchmarking of performance

Studying and emulating good practices of comparable incubators has potential for enhancing performance. In the corporate sector, programmes have had mixed success as the adaptation of existing work habits and mind-sets poses problems. You may learn to run the same race faster, but you may really need to be on another track altogether! Then again, as Will Rogers said: ‘Even if you are on the right track, you’ll get run over if you just sit there.’

An exercise was initiated at Polish incubators in 1995. This compared performance coefficients including incomes and operating expenses per square metre of rented space, capital investments per square metre and per job created, subsidy from state, rentable space out of gross floor space, occupancy rates, and job creation per unit of state subsidy. Persuading incubators to share such information is not easy, even with assurances of anonymity. Yet, where feasible, such cooperation to compete can be fruitful.

The EU programme involved fifteen countries, and considerable effort was deployed in arriving at a consensus among managers from each country on the framework conditions, distinguishing characteristics and common indicators to be assessed. It would be easier to make a start on a benchmarking programme on incubators with comparable approaches within a single country.

The willingness of incubator managers has to be mobilized, with the assurance of confidentiality in the information they provide. It is not possible to make valid comparisons on a continuing basis without the shared understanding of all concerned. It certainly would help to have a committed source for funding such an exercise, as was the case for the EU programme. The sponsors need to encourage (and make financial provision for) the collection of all pertinent data, and be realistic in terms of the time and expectations of such a benchmarking programme.

The real longer-term benefits can only come when the processes are established for securing the data required to assess each coefficient, honestly, accurately and promptly; for disseminating the distilled data confidentially on an agreed schedule; and then, importantly, for helping the incubator management team raise its level of performance to higher levels, attribute by attribute.

Table 21: Public capital and operating subsidy for ParqTec (1997, estimate)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total jobs (with an employment multiplier of 1.5)</td>
<td>357</td>
</tr>
<tr>
<td>Capital cost subsidy per year (20-year straight line depreciation)</td>
<td>US$19,150</td>
</tr>
<tr>
<td>Operating subsidy per year (average over the last 3 years)</td>
<td>$147,000</td>
</tr>
<tr>
<td>Capital and operational subsidy per year</td>
<td>$166,150</td>
</tr>
<tr>
<td>Total subsidy over 7 years</td>
<td>$1,163,050</td>
</tr>
<tr>
<td>Subsidy cost per job (excluding jobs in affiliates)</td>
<td>$3,258</td>
</tr>
<tr>
<td>Estimated payroll and corporate taxes by clients and graduates</td>
<td>$1,054,320</td>
</tr>
<tr>
<td>Return on public investment as taxes per year</td>
<td>$6.34 per $1</td>
</tr>
</tbody>
</table>

Table 22 provides a summary of key averages, ranges and benchmarks that can be quantified. The values are based on an analysis of the Centre for Strategy & Evaluation Services (CSES) survey data and discussions with incubator managers on best-practice standards. It should be stressed that, given the diversity of incubator operations and objectives, the benchmarks will not apply universally. Similarly, it is not possible to quantify benchmarks for many aspects of incubator operations.

The European study identified a set of key indicators through which performance can be compared and enhanced, as shown in Table 23.
Table 22: Key performance statistics and suggested benchmarks

<table>
<thead>
<tr>
<th>Setting Up and Operating</th>
<th>Average</th>
<th>Range</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average capital investment cost</td>
<td>€3.7 million</td>
<td>€1.5 to €22 million</td>
<td>n.a.</td>
</tr>
<tr>
<td>Average operating costs, per annum</td>
<td>€480,000</td>
<td>€50,000 to €1.8 million</td>
<td>n.a.</td>
</tr>
<tr>
<td>% of revenue from public subsidies</td>
<td>37%</td>
<td>0% to 100%</td>
<td>25%</td>
</tr>
<tr>
<td>Incubator space</td>
<td>3,000 m²</td>
<td>90m² – 41,000 m²</td>
<td>2,000–4,000 m²</td>
</tr>
<tr>
<td>Number of incubator clients</td>
<td>27 firms</td>
<td>1–120 firms</td>
<td>20–30 *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incubator Functions</th>
<th>Average</th>
<th>Range</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubator occupancy rates</td>
<td>85%</td>
<td>9%–100%</td>
<td>85%</td>
</tr>
<tr>
<td>Length of tenancy</td>
<td>35 months</td>
<td>6 months – no maximum</td>
<td>3 years</td>
</tr>
<tr>
<td>Number of management staff</td>
<td>2.3 managers</td>
<td>1–9 managers</td>
<td>2 managers minimum</td>
</tr>
<tr>
<td>Ratio of incubator staff / clients</td>
<td>1:14</td>
<td>1:2 – 1:64</td>
<td>1:10 to 1:20</td>
</tr>
<tr>
<td>% of managers’ time advising clients</td>
<td>39%</td>
<td>5%–80%</td>
<td>50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluating Services and Impacts</th>
<th>Average</th>
<th>Range</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival rates of tenant firms</td>
<td>85%</td>
<td>65% –100%</td>
<td>85%</td>
</tr>
<tr>
<td>Average growth in client turnover</td>
<td>20% p.a. (2001)</td>
<td>5%–100% p.a.</td>
<td>25%</td>
</tr>
<tr>
<td>Average jobs per tenant company</td>
<td>6.2 jobs per firm</td>
<td>1–120</td>
<td>n.a.</td>
</tr>
<tr>
<td>New graduate jobs per incubator, p.a.</td>
<td>41 jobs</td>
<td>7–197</td>
<td>n.a.</td>
</tr>
<tr>
<td>Cost per job (gross)</td>
<td>€4,400</td>
<td>€124 to €29,600</td>
<td>€4,000 to €8,000</td>
</tr>
</tbody>
</table>

* see note below on setting up and operating incubators

Notes:

**Capital investment and operating costs:** It is inappropriate to set benchmarks for incubator capital investment and operating costs, because these will vary widely depending on the type of incubator. For example, a biotechnology incubator requires dedicated laboratory space as well as office space, whereas an incubator providing just office space to new start-ups will require less capital investment.

**Proportion of revenue dependent on public subsidies:** While the public funding requirements of incubators will inevitably vary depending on location-specific factors such as the dynamism of the regional economy and the extent of market failure, we have assumed that incubators should try to increase the proportion of operating costs derived from their own activities (rent, advisory services, etc.).

**Incubator space/number of clients:** The average incubator space in the survey was 3,000 m². There is a good deal of evidence to suggest that a minimum of 2,000 m² space is needed (enough to accommodate 20–30 companies) to achieve economies of scale. We suggest a range of between 2,000 m² to 4,000 m² as a benchmark, depending on the type of incubator.

**Length of tenancy:** A benchmark of 3 years is suggested. It should be noted that the benchmark applies to the average incubator and would not be appropriate for some specialist types of incubators – e.g. biotech, high-tech R&D and high-tech manufacturing incubators – because of the longer delays required for product development associated with those business sectors, among others.
**Number of managerial staff and ratio of staff/clients:** The benchmark of at least two managers assumes an average of 20–30 clients and allows sufficient flexibility to cover absence (training and professional development, conferences, holidays, sickness, etc.), while still ensuring that tenant firms have permanent access to managerial-level advisory support at all times. Given that the real added value of incubation lies not in real estate aspects but in the quality, relevance and utility of its business advisory service, the ratio of incubator managers to incubator clients should ideally not exceed 1:20.

**Proportion of the management team’s time advising clients:** Currently, the proportion of the management team’s time spent advising clients, highlighted in the survey, stands at 39%. We have assumed that, ideally, it should be possible to ‘free-up’ management so that more time is spent advising clients and less on administrative matters.

**Survival rate of tenant firms:** The survey revealed that the survival rate of firms reared in an incubator environment was significantly higher than the business success rate among the wider SME community, estimated at 30%–50% (over a 5-year period). In the survey, there was a notable clustering of incubators reporting a survival rate among tenant firms of 80–90%, and the benchmark is based on this. The survival rate of incubator tenant firms operating in more high-risk sectors, such as high-tech industry, may well be lower. We would emphasise that survival rates are just one indicator of the performance of incubators; of more importance is the extent to which incubators can contribute to the accelerated development of innovative, high-growth firms and their capacity to create new jobs.

**Job creation – average jobs per tenant company/new jobs per incubator:** While employment creation is one of the key objectives of business incubators, setting a benchmark for the number of jobs created per firm or per incubator would be inappropriate because the number of jobs created will vary greatly depending on the type of companies being incubated, the number of clients the incubator can accommodate, and the amount of available space. The number of jobs generated by a typical tenant company will vary immensely depending on the type of industry the firm specializes in, the extent to which industry is technology-intensive as opposed to labour-intensive. Similarly, the total number of graduate jobs created per incubator will vary because the total aggregate number of firms varies widely between incubators specializing in different types of industries.

**Cost per job:** The average gross cost per job, according to the incubator survey, was €4,400. When set-up costs and the amortization of capital are taken into account, the figure rises to €6,700. Rather than setting a benchmark, we have set a range, which we feel is more appropriate given that incubators receive widely differing levels of support from the public sector and the EU, depending on location-specific factors.
Table 23: Range of indicators to assess incubation performance

## I. IMPACT/OUTREACH

1. **Enterprises created**: that is, those graduating from the TBI and entering the market.
2. **Survival rate of enterprises**: Those terminating over a defined horizon are difficult to identify.
3. **Jobs generated (in about 6 years)**
   - (a) *in incubated/affiliated firms*: This is not a primary TBI objective, as all ventures, particularly start-ups, need to operate at high productivity and reduce costs.
   - (b) *in graduated firms*: It is difficult to get reliable data from those who have left.
   - (c) *indirect jobs*: Again, a complex but necessary estimation.
4. **Enterprises reached**: These indeed are a very small proportion of the total number of new ventures created.
5. **Replication of the ‘pilot’ model**: If demand for space and services is strong, additional TBIs can be established on a hub-satellite basis, sharing personnel and multiplying outreach.
6. **Other BDS options**: Comparisons with other options are seldom made, nor have there been studies of a control group of entrepreneurs who started concurrently but outside the incubator.

## II. EFFECTIVENESS

7. **Employment per net US dollar subsidy**: Subsidies are often stealth, coming in different guises and from a variety of sources, direct and indirect.
8. **Taxes paid and returns to state per net US dollar of subsidy**: Some studies indicate returns of US$4 to $6 as ‘taxes payable’ per US$1 subsidized.
9. **Growth of client net worth, sales and exports**: In developing and restructuring countries, this information is generally not shared with state officials or rival businesses.
10. **Research commercialized**: This depends on the completion of the transfer, patenting and licensing.
11. **Management dynamics**: The capability of the Board/management team to provide needed services at reasonable profit margins, to access external professional services, and to win the confidence and appreciation of the clients.
12. **Disadvantaged groups**: Facilitated access for peripheral communities, youth and women.
13. **Seed venture capital mobilized**: This can be an indication of reputation among the financial community.
14. **Overall profitability of incubator**: Overall returns on investment? Direct/indirect subsidies still being received? Proper provision for depreciation and taxes?
15. **Time to break-even**: How many years has it taken since the entry of the first client for the incubator income to exceed operating expenses?
16. **Additionality**: A good justification for incubation is its attribute of enhancing the survival and success of its clients, compared to those in the open market.
17. **Incubator expansion**: The willingness of sponsors to expand their TBI may be some indication of their satisfaction with outcomes.
III. SUSTAINABILITY

18. **Revenue surplus (6 years):** A TBI’s cash flow, based on good accounting practices (which vary among countries) should indicate overall financial health and progress towards self-sustainability.

19. **Services cost recovery:** This depends on the type of services and cross-subsidization. Some, such as marketing or accounting, can provide 100% + recoveries, while others, such as training and counselling, only 30%–50%.

20. **University-business links:** This should be demonstrated qualitatively by the extent of interactions and support.

21. **Stakeholder satisfaction:** Well-structured interviews can indicate the appreciation of TBI services provided and their overall usefulness to the respective stakeholders.

22. **Tenant/graduate satisfaction:** Same as above.

23. **Changes in culture:** The transformation of the image of the community as pro-entrepreneurship.

24. **Enhancement of entrepreneurial skills and self-esteem:** Same as above, noting however that TBIs do not create entrepreneurs but do nurture nascent aptitudes.

25. **Leveraging state policies:** This can have a major effect in many restructuring countries.

26. **Others, specific to the TBI:** Those capable of raising the level of public consciousness for biotech development.

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**BOX 20: ACTION POINTS**

A designated workspace and the one-on-one counselling services that a TBI provides are more expensive than group approaches and can only be justified when results are commensurate with costs. The imperative of enhancing incubator performance requires:

- that the Board and the management team be fully abreast of innovative developments in venture creation, through continuous learning and participation in national and regional associations;
- the building of networks of synergistic partnerships with universities, research institutes, finance sources, corporate and public sectors, in order to make a practical value-adding contribution to the progress of the nascent business;
- focusing on similar attributes that a venture capitalist pursues: the management of the venture, its market, and its momentum;
- continuous efforts to learn from other incubators and the adaptation of good operating practices to local conditions and needs;
- special measures to improve the overall incubator cash flow through increased revenues and the prudent management of expenditures, and to assist the client-ventures to secure seed capital for their own needs;
- the monitoring and assessment of the effectiveness, impacts, and outreach of incubator operations based on data collected on all pertinent aspects of the incubator, clients and graduates.

The benchmarking of performance to raise the quality of comparable incubators has not yet been implemented successfully. This could be a special new responsibility of incubator associations in the future. So could the process of the ISO-9000 type certification of incubator performance. But these are tools to help in the proper use of the sponsors’ and entrepreneurs’ limited funds, and to demonstrate the benefits and costs of incubation.

Overall, the business incubator should be run like a business, with the perspective of attaining a reasonable level of sustainability.
Lessons learned

Business incubators share a characteristic with other forms of human endeavour – success is multifaceted and complex. Success comes from accomplishing a number of tasks quite well. Success is often serendipity. And success, like beauty, is often in the eye of the beholder!

Problems and limitations of incubators

For a variety of internal and external factors, incubator planning and operations involve problems and risks in successful performance. These include the following:

- The feasibility process is often skipped, or the business plan not promptly implemented, due to political constraints and a lack of clarity on incubator strategy. There is inadequate involvement of local business and the community.
- The legal structure does not permit reasonable autonomy for governance and management, nor facilitate building lease/purchase and operational flexibility.
- Start-up finance and working capital for the incubator are inadequate, or the needs underestimated. Overlapping SME support initiatives cause the wasting of resources.
- The location may be chosen for political considerations. Empty building spaces may be chosen for the site simply because they are available, despite the fact that poor layouts and a difficult acquisition process make them unsuitable.
- Renovation costs may be excessive, due in part to opulent appearances – what might be called the ‘Taj Mahal syndrome’ or the ‘edifice complex’.
- Entrepreneurship is undeveloped and poorly understood and accepted by the local community. There is resistance to leave the incubator. The cultural preference may be for an ‘incubator without walls’, where persons work on their own premises.
- The manager is often a state or university official with poor communication, networking and business skills, and a low salary. The team requires intensive training, at home and abroad, with continuous access to books, journals and videos.
- Markets: The main constraints include limited access to markets, management skills, and trade and technology information, and an unfair competition from state enterprises.
- Seed capital for clients: Many sources of finance are established, but cannot be readily accessed due to bureaucratic lending procedures, high collateral and interest, or to a lack of information on funding sources.
- State policies, regulatory environment and tax structure are unfriendly (if not hostile) to small-enterprise development, and governance is not transparent. New decrees and incentive mechanisms are required governing property, accounting standards, banking, taxation, stock markets, foreign investment, bankruptcy, and the resolution of disputes.
- Impacts of culture, history and geography that affect the venture creation process have not been recognized or taken into consideration.
- International linkages are still weak. Special efforts are required to link up to regional incubator associations and partners who, in turn, need to take special measures to serve emerging country incubators, to mutual interest.
Lessons learned

Over the last fifteen years, many lessons have been learned on supporting the start, survival and success of technology ventures. The skill endowments and business infrastructures are generally poorer in restructuring and industrializing countries than those available in the industrial world, and strategies have therefore to be customized to meet their conditions. The rapidly growing technology park and incubator operations in the East Asian countries, and the trends towards convergence, point to driving forces which make for success. They also indicate the actions that governments, business and stakeholders should take to mobilize these forces.

As noted, business incubators are diverse in their types, purposes and missions, and very much dependent on community needs. Good practices (not necessarily best, which are specific to time and place) should be identified and adapted to the specific context. The main lessons emerging from the recent experiences of planning, implementing and operating TBIs are summarized below.

A. In the planning stage

1. Establish realistic goals and select strong partners

At the outset, the success factors are to search for and identify:

- the proper niche and mission for the incubator depending on local endowments
- proactive partnerships between the five interlinked rings in the Olympiad of venture creation, that is, the government, university, the private sector, service professionals and the international community
- sponsors willing to invest their reputation and energy, with a clear understanding of their responsibilities and expectations (their commitments must be serious, not rhetorical, and in writing if necessary)
- consensus among stakeholders on the purposes and parameters of the TBI, expressed in the form of a mission statement.

Example: The Foundation Biominas biotechnology incubator in Brazil represents a good example of collaborative efforts, in this case between private biotech entrepreneurs, the Minas Gerais state government, the Belo Horizonte municipality, the public research institute CETEC, and several local universities, together with federal financing agencies such as SEBRAE and FINEP. They have a strong commitment, an articulated vision of building a technology park adjacent to the TBI, and a mission of promoting technology in the state of Minas Gerais.

2. Create linkages to research, learning and professional communities

Successful technology incubators invariably have:

- Preferred access to, or an embedded association with, the resources of a major research laboratory or technical university. Importantly, this also provides an aura or halo-effect of respectability for both the incubator and clients. The differences in cultures of academia and business have to be recognized and reconciled to the extent feasible.
- Well-developed networks of professional friends and alumni, who may contribute an annual subscription to a Patrons Club, provide mentoring to individual clients and serve on a advisory committee.
- A synergistic system of agencies provide the financial, knowledge and business support, to mutual advantage.

Example: A good example of mutually supportive mechanisms is at the University of Texas, Austin. The Austin Technology Incubator is linked through the Center for Commercialization and Enterprise to the NASA Commercialization Center, the Software and Entrepreneurs Councils, the Texas Capital Network, and the IC2 Institute.

Similar synergies are in evidence between the Rensselaer Polytechnic Institute faculty, students and alumni, its Venture Affiliates network for mentoring, the Center for Technological Entrepreneurship, and the RPI Incubator and Technology Park.

3. Leverage state policy and legislative support

The supportive environment for sound incubator performance requires:

- stable political and economic regimes, providing positive support, or at least a level playing field, for private sector initiatives
- a competitiveness strategy that has analysed the sub-sectors of advantage, selected the change agents and markets
- human resources development that helps build the full range of specializations needed, from technician to researcher and manager
• regulatory and legal systems that facilitate technology venture creation, despite the inherent risks
• functioning systems for banking, stock markets, taxes, property – including intellectual property – and environmental protection

Example: Technology Park Malaysia (TPM) and its incubation system, within the Multi-Media Super Corridor, are key components of the government’s Vision 2020, which, among other aspirations, is pursuing a radical transformation to a modern technological society. The state has made a large investment in TPM, which was then turned into equity (corporatized) and now functions as a private–public entity. Other interesting features of TPM are the on-campus university robotics and biotech centre and the support centres for precision prototyping, CAD/CAM, and documentation and recreation centres.

4. Select a location with good business infrastructure
Mistakes in location are permanent ones, often fatal to survival.
• The political wisdom may call for expansion to backward regions, but, for a TBI, this must be resisted.
• Site selection must be based on commercial, engineering and environmental considerations in a developed urban environment.
• While it should be connected to knowledge bases such as technical universities and research laboratories, it should also give some indications of entrepreneurial energy.

Example: The Isando Enterprise Center of South African Breweries (SAB) is well located in an industrial area adjacent to Johannesburg international airport. The incubator occupies 2,300 m² of well-renovated, functional space at an old brewery complex. SAB’s Project Noah has not only demonstrated sound engineering skills at rehabilitating a derelict building, on budget and on schedule, but also its corporate responsibility in creating alternative jobs for laid-off employees.

5. Plan the physical facility to stimulate interaction and creativity
To build or not to build a custom facility, that is the first question. It depends primarily on the availability of suitable vacant space and of funds for new construction. The essential design features of the facility, new or renovated, are:
• functional and flexible space, over 2,000 m² (with provision for expansion), of which ideally three-quarters should be leasable
• a layout allowing circulation and interaction between clients
• specific technology-related features such as internet connectivity, effluent disposal, loading dock and storage, and perhaps selected shared equipment
• above all, a friendly, efficient appearance of both building and staff, to attract and serve creative people.

Example: The Ben Craig Center (BCC), Charlotte, North Carolina, USA, adopted the option of starting in a rehab space, then moving to a splendid custom-designed building. The two-storey, 5,000-m² structure (see layout in Annex 4) has both an attractive appearance and a fine juxtaposition of spaces for tenant interaction, seminars, recreation and incubator management. The University of North Carolina Charlotte Foundation borrowed the money towards the US$3.5 million cost, and has leased it to BCC Inc.

In industrializing countries, examples of attractive incubator buildings with good layouts include those in Istanbul and Ankara, Turkey, supported by the state’s small business development agency (KOSGEB) in partnership with the local technical university. In China, the incubator buildings are notable for their large size and fittings. The challenge is to be attractive in design but functional and affordable.

6. Undertake rigorous feasibility and business planning exercises
The analysis of feasibility and the discipline imposed by the business plan is essential to the preparatory process. This is the road map, pointing to the attractions and danger zones along the way. This preparation requires the following:
• The incubation system must be planned within the context of national priorities, building on local culture and securing consensus among stakeholders, at every step.
• The design of support services must be based on the real needs of the potential ventures, adding value to their operations while being affordable.
• Feasibility analyses should be validated. Financial projections need to be realistic, while recognizing that the incubator itself is a venture, and not without risks.
• In the preparatory process, local consultants need to be given opportunities to build their own experience, supplemented by selected external inputs.

Examples: Many TBIs have been started without a formal study, on the grounds that a state sponsor is already willing to provide finance, and that economic conditions are so uncertain that a plan would soon become obsolete. Initially in Mexico, CONACYT was indeed willing and able to finance incubators, but then economic conditions changed, funds became scarce, and some incubators had to close. Management teams should therefore plan to move towards a reasonable level of self-sufficiency as rapidly as possible.

At the University of Technology, Jamaica, the feasibility analyses built upon an existing entrepreneurial extension centre. Despite the sound business plan and local support, it has taken two years to mobilize the finances needed from international sources. But the incubation of student-entrepreneurs was already underway before the new incubator building was ready.

7. Mobilize information and communications technologies
Information and communications technology (ICT) is revolutionizing the way that incubators and their clients work. The impact is enormous and the pace of change very rapid. Some trends are clear: the importance of physical facilities will further diminish, while services will become more important; e-incubators will provide counselling and training to physically remote ‘clients’; this will also enable start-up firms to source technology and raise funding from a wider base; incubators around the world are being linked together in a virtual community, which in turn will facilitate the spread of good practices.

Example: In addition to using ICT as a utility service, a large number of start-up firms are producing products for the market as well as ICT-enabled services. The Panama Technology Business Accelerator is designed to attract such ventures from within the country and from the Central America region. Its location in the Panama International Technology Park, within the new City of Knowledge, provides it with a knowledge framework.

The SODBI incubator at Shymkent, Kazakhstan, is notable for the range of websites it has created to support SMEs, tourism and other services in the region. It also has an active computer-training school for external students.

8. Secure ‘patient money’ for TBI operations
The single greatest hurdle to the incubator and tenant operations is obtaining access to the requisite finance. Sponsors need to ensure that:
• the requisite funding for implementation and working capital will be made available from the outset; and that
• operating expenses are controlled while revenues are expanded from rentals and services, to move towards break-even when operations have matured.

For the clients, the management team has to:
• secure information on credit, equity, royalty, grant and other finance sources
• help them prepare a business plan and financial strategy
• develop, where possible, an in-house seed-capital facility for short-term commercial credits and equity investments.

Example: In some countries, governments have seen incubators as a part of the social infrastructure for nurturing entrepreneurship, which can create enterprises, some of which can in turn give birth to important innovations and significant employment. Among these are Israel, Turkey and Malaysia, where a large proportion of incubator income comes from continuing state subsidies. This is also true in many OECD countries. Countries such as Poland have had large resources from the donor community, which later create their own problems of dependencies.

Non-financial support to the incubator and barter of services can be helpful. For instance, the Business Residency Programme at the Center for Business Innovation, Kansas City, Missouri, allows university graduate students to work with the companies and outside affiliates, and as part of incubator staff. The programme is funded by foundations and the university. A similar state programme in Brazil provides grants (bolsistas) for graduate students to work with incubator companies, to their mutual advantage.

B. During the implementation
9. Select and train a dynamic management team
Searching, training and motivating the best possible team is key to success:
• The management team has to be lean, accessible and supportive.
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- Its training, at home and abroad, should be continuous, allowing the acquisition of new skills for changing needs.
- Its time and energy have to be allocated as much to the clients themselves, as to strengthening the community network, responding to the sponsors and the Board, and raising resources for the incubator and its clients.

**Example:** In many cases, it has been extremely difficult to recruit a manager matching the required profile, despite repeated advertisements and extensive interviews. A selected candidate who has some business experience will not take the job if the Board is not willing to pay a private-sector salary; or he or she may insist on staying in the capital city and commuting to the incubator an hour away; or, having been hired, the new manager will soon leave as no real authority for operating the incubator has been delegated.

For the incubators in **Indonesia** and **Malaysia**, the management teams were trained at US incubators and NBIA conferences, but the turnover has been high. The **China** Association for International Science and Technology Cooperation (CAISTIC) has organized annual courses in Shanghai for managers from industrializing countries. An EU-supported Management Training Institute is being set up for **European** incubators. There is clearly a case for a structured programme or institute dedicated to the special needs of developing countries.

10. Select and prepare entrepreneur groups
Careful choice contributes to the success of the entrepreneurs and the incubator:
- In many developing and former Communist countries, a growth-potential group will have to be ‘pre-incubated’ before entering the incubator, in order to revive and guide entrepreneurial aptitudes. They also need to be supported after leaving the incubator.
- Word of mouth is a good promotion to attract candidates, but needs to be supported by a continuing marketing campaign.
- Special care is needed in selecting the initial batch of clients, so that the incubator can start with a reputation for success.
- Like the venture capitalist, the incubator management team has to look for the ‘three Ms’ – management, market and money – and then for technology (+ T).

**Example:** The Advanced Technology Development Center (ATDC) at Georgia Tech, **Atlanta, Georgia**, USA, has a structured four-step due-diligence programme to make the best selection from a pool. First, an internal consultant makes an overall review of the three Ms + T and compatibility to the incubator’s goals. Then, graduate students help do a survey of the potential market for the proposed innovation – a difficult but essential task. Next, a senior consultant makes an in-depth assessment of the growth potential and of the financial and human resources that are planned to be mobilized. Finally, a panel undertakes an in-depth validation of the applicant’s business plan and strategy.

This due diligence (DD) process takes two to six weeks, involving some 10–80 hours of staff time. ATDC may accept the client as a full member in the incubator, or on a provisional basis with specified milestones. The DD process also serves to guide the development of the selected company through the incubation and beyond. Whether so structured or not, every TBI needs to establish a proper selection process.

C. During incubator operations

11. Organize to provide quality value-adding services
The ultimate aim of the incubator is to launch its clients into trajectories of growth, through:
- tailored programmes of direct intervention on capacity building, counselling and networking services, suited to each tenant’s needs
- linkages to the best available professional services in the community, to lab facilities, faculty expertise, and to graduate student and interns
- informal networking to secure practical advice from successful entrepreneurs and finance from business ‘angels’.

The incubator must:
- allocate manager’s time to respond to tenant’s needs on request, and proactively through the monitoring of its performance
- focus on gaps in the technopreneur’s skills, usually financial management and marketing, as well as special needs for shared hardware
- do all this at the most affordable terms, keeping also in mind the need to raise cash for the incubator itself, and easing the exit of those whose efforts are not likely to bring the product or service to market despite all efforts.
Example: Despite the importance of direct support to clients, most incubator managers spend less than one-quarter of their time on this, as they have to spend much time with sponsors and boards for maintaining political and financial support.

Among industrializing countries, the Hong Kong Industrial Technology Center (HKITC) is expanding its range of support to its members and helping place Hong Kong at the forefront of advanced technology development. In addition to HKITC’s traditional services, its annual TechWorld Expo and monthly Technology Investment Forums have matched new ventures with venture capitalists, while its hosting of high-level delegations and missions to Silicon Valley, Israel and the UK, help in acquiring new experience and in promoting its companies. In the future, the incubator’s IT graduates can move to the new Cyberport, while hardware oriented companies can opt for the Science Park.

12. Enhance TBI performance and raise income

- Make regular cash-flow projections into the foreseeable future (12 to 24 months), to flag impending problems requiring focused efforts.
- Become results-oriented, exploring innovative ways of augmenting revenues (e.g. the possibility of raising rents, renting out any vacant space, and/or delivering new services for emerging needs).
- Review ways of reducing expenses (and/or search for new sources of grants and operating subsidies).
- Experiment with innovative schemes of financing, such as equity investments in client firms and royalty arrangements, to create flows of deferred income.
- Raise the skills of the incubator management team through continuous learning opportunities at conferences, through courses, and internet access to data, information and knowledge.

Example: Only a small proportion of the world’s incubators are private for-profit entities (perhaps under 20%). One of these, the Lexington Business Center at Elkhart, Pennsylvania, USA, is showing a 30%-plus return on equity through prudent management, no-frills facilities, the bartering of some services, and positive state and city involvement. TBIs need to provide custom-built facilities with larger capital investments and focused technology-related services requiring trained staff and special services.

At another level, the SODBI Incubator in Shymkent, Kazakhstan, has a variety of team-building activities and innovations. These include an ‘Innovation Box’, where staff members drop their suggested incubator improvements, to be assessed by the full staff every Friday for a small cash award. At this Friday meeting, staff members present a one-page weekly summary of their priority tasks undertaken, completed or still pending. The full team goes on a ‘retreat’ every few months in a scenic place, to share ideas.

13. Monitor the performance, assess effectiveness and expand impacts
Success calls for constant vigilance and improved performance, not complacency. Towards this end, the management team has to:

- organize a management information system, based on modern computing applications, to record (and take corrective actions) on its operations and those of its members – historical and current, clients and graduates;
- formulate common definitions and methodologies for assessing incubator effectiveness, and agree with sponsors from the outset upon quantifiable measures of success;
- develop a national benchmarking programme to evaluate performance compared to peers;
- persuade stakeholders of the usefulness of incubation to the community and country, based on demonstrations of benefits/costs; and
- replicate the experience, and enlarge the outreach and impact, by planning new incubation modes and expanded networks. (Affiliates programmes seek to enlarge the incubation benefits. The ‘franchising’ of incubation technology may be an idea whose time has come.)

Example: Incubators have been reported to be operating at net public subsidies for investment and working capital of US$3,000 to $6,000 per direct job created, and to be returning $4 to $6 in taxes per $1 of subsidy. Here again, there is no common understanding on the content of subsidy, nor what would constitute a ‘good’ (direct or indirect) job, nor the time horizon to be considered.

Recent studies on the Michigan incubators are a beginning; these can be elaborated and extended, particularly in the context of serious donor concerns on the sustainability of all small business development services.
In Uzbekistan, Indonesia and Egypt, as soon as the initial pilot incubators were in operation, the authorities initiated a master plan to add another 20 or more incubators, even before the performance of the pilot could be properly evaluated.

14. Create an outward-looking incubation system for the future

Globalization, accentuated by internet technologies, poses special challenges for TBIs, while providing the means for collaboration across borders, both intra- and internationally. This situation requires incubator managers to:

- plan an international orientation, whereby foreign companies can be facilitated to enter their market, and local companies to venture abroad; and, for this purpose;
- develop not only world-class facilities but, importantly, the multicultural, multilingual, international business skills for supporting companies with different perceptions and practices;
- assist their local companies, to decide whether they have the wherewithal to enter international markets, and if so, prepare the strategies for exports, joint ventures and other means; and
- promote the incubator and clients by hosting international technology/business delegations, organizing missions abroad, and participating in international conferences.

Example: The China IBI programme is an ambitious effort, serving some foreign companies and expatriate Chinese who have capital and expertise to bring home.

Similar trans-nationalization is underway through support to German companies in Shanghai and Atlanta, US companies in Germany through the Ben Craig Center branch, and international companies at IBI, San Jose. The Asia Association of Business Incubation (AABI) is developing selected AABI Incubators that will host ventures from other nations.

Future trends

Incubation can now be said to have attained the level of an industry, not just a passing phenomenon. As such it attracts greater scrutiny.

Nevertheless, many misconceptions persist, as outlined in Box 22).

Myths and limitations

Limitations

While incubators are demonstrating benefits, this modality is not without its limitations, which need to be addressed:

- Incubators represent aspects of both public policy and private business, each with different goals. The measures of performance for the public sector may be the number of jobs created, while the business sponsor looks for return on investment. Failure to develop agreed measures of performance and reconcile differences in expectations from the onset can result in problems.
- While the incubator can stimulate entrepreneurial activity under defined conditions, its role in creating large numbers of jobs or promoting rural development has yet to be established. As the incubator provides focused, one-on-one help together with shared office facilities and space, its investment and operating costs tend to be higher than for the basic single-service business development services (BDS).
- The incubator selects companies with high growth potential and greatly increases their chances of success. It is thus considered unfair and elitist. But, in the longer term, the process of selection saves the prospective poor performer some costs and frustrations.
- When a business fails, the tendency for the entrepreneur is to assign the blame to the incubator and its support programmes. Furthermore, the tenant may graduate from the incubator but still need advisory support and a new space to continue operations. These needs have to be foreseen, by linking the incubator to an industrial/technology park and by designing an outreach programme.
- Sooner or later, the incubator management team and sponsors may be required to support the relatives of persons of influence. Strong political and community support are essential, but the incubator cannot be allowed to become a ‘political football’.
- The goal of incubation is the creation of successful, vibrant businesses. Some will not survive and must be removed from the incubator to make space for potentially viable enterprises. Without resolve on the part...
of the management team, the incubator can become a haven for financial cripples, or a home for hobbies.

• The incubator is human resource intensive, requiring highly entrepreneurial managers and professional support networks, which are difficult to find.

• While for decades governments and international donors subsidized SME support mechanisms, today there are expectations that every system be self-reliant at the earliest possible. A balance has to be struck between entrepreneurship development, as a social responsibility of governments, and viability in the longer term.

• Where financial resources are severely limited and need for employment generation is enormous, the cost per job created in the incubator in the short-term may be considered high. But in the long run, some graduated ventures will grow rapidly, reducing the cost per job. The costs of business incubation are comparable to many other BDS systems, when fairly assessed using common yardsticks. Despite its shortcomings, a carefully designed, executed incubation strategy can be an effective instrument for economic development. To the axiom: ‘Use many instruments, but none in excess’, one could add Einstein’s quote: ‘Everything should be made as simple as possible, but not simpler.’

In addition to the internal determinants of success, other national and international factors outside the incubator can influence its success. Relevant government, corporate, banking, donor and non-governmental organizations have to be brought into the venture creation dialogue. External factors can be summarized as follows:

• A national technocratic leadership regarding the creation of technology-based enterprises, boldly articulated and disseminated, with incentives for innovation and risk-taking.

• A macroeconomic framework that stimulates innovation and markets for new goods and services, together with a strategic vision, developed in consultation with local communities, entrepreneurs and stakeholders.

• Significant investments in knowledge including scientific research and technology development, engineering and management consultancy, technical education and continuous learning, quality assurance and environmental preservation, electronic connectivity, transport, and communications infrastructure.

• Cultural attitudes to risk-taking, the delegation of responsibility, individualism, and other behaviours that may facilitate or hinder venture creation and growth.

• Historical legacy of slavery, colonialism, or occupation that leaves a profound impact on business formation.

• ‘Convergent enterprise support systems’ encompassing the full range of small business development services, anchored possibly in an incubator and technology park.

• Regional, national and local programmes for energizing entrepreneurship from school onwards.

• State financing programmes to deploy patient money for investment and working capital at the incubator, together with readily accessible sources of credit and risk capital for the clients.

• A symbiosis between large corporations and the early-stage companies, not only as an expression of corporate citizenship but also in terms of mutual benefits.

• Strategic relationships with relevant agents, national and international, particularly the consulting, manufacturing and service sectors, banking, legal and accounting services, and business associations and chambers.

• Transparency and honesty at all levels. And Good Luck, that is, the readiness to be at the right place at the right time, with the needed capabilities.

Overall, the development of a reinforcing support system calls for sensitivities to global concerns of equity and ethics, gender balance and environmental preservation.
**Future incubation trends**

National and international responses to establishing and operating incubators have to be based on their present conditions, while keeping in mind likely future developments. The discernible trends are:

- **Technology orientation will still be dominant:** Exponential change in software, microelectronics, communications systems, renewable energy and environment, advanced materials, nanotechnology and biosciences are creating challenges. Special-purpose TBIs will be required for these disciplines. There are also opportunities for combining advanced techniques with traditional processes, in agribusiness, textiles and light manufactures.

- **The internet will continue to transform the way businesses work:** large and small, in all nations. Incubator managers and their clients who are on top of this revolution will

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**BOX 22: MYTHS ABOUT INCUBATORS**

Myth no. 1: ‘The incubator is only a building with shared facilities.’
It is a process, a means to nurture, to improve chances of success.

Myth no. 2: ‘Incubators make money.’
Not in the short term. But they must be run as businesses, for the longer term. And some do make money.

Myth no. 3: ‘Incubators rapidly create employment.’
Incubators create enterprises, some of which grow rapidly to create direct jobs (and as many indirect jobs).

Myth no. 4: ‘It is government’s responsibility to finance incubators.’
While governments should provide seed money, the private sector must participate, in enlightened self-interest.

Myth no. 5: ‘Entrepreneurs come to the incubator with good project ideas.’
Incubator managers must proactively search out good ideas, markets and entrepreneurs.

Myth no. 6: ‘Entrepreneurs are born, not made.’
Entrepreneur development programmes, from school onwards, can help identify entrepreneurs and enhance skills.

Myth no. 7: ‘Incubation is a simple concept, easy to implement.’
It is often difficult to adapt to local cultures, especially when infrastructure and entrepreneurial attitudes are still nascent.

Myth no. 8: ‘Incubators are a panacea for economic growth.’
They are not. They are derived from other BDS mechanisms, and must be considered an additional instrument as part of a national SME strategy.

Myth no. 9: ‘Incubators are a “fad”, which will soon disappear.’
Currently, incubators are growing worldwide at the rate of two every week.

Myth no. 10: ‘Incubators are for small companies.’
Incubators are really for growing big companies, which, at the present time, are small start-ups.
win; the others will be left behind. Use of the internet is rising rapidly in many of the industrializing countries, and with the spread of better hardware and credit card use, e-commerce is not far behind.

- **Venture creation and job creation in small towns and rural settings** call for a better model to address bottom-up, regional development. This will require the appropriate choice and combination of technology, higher value-added in agribusiness, environment, energy-conservation, light chemicals and engineering, for domestic and export markets.

- **Enhanced professionalism in incubator operations**: The managers of the future may have to be accredited by a national association, in order to demonstrate and continuously upgrade their venture creation, technology sourcing and networking skills.

- **Stronger emphasis on assessment and monitoring of performance**: Incubators will have to demonstrate by their performance that state support for incubators is not just a subsidy but a social investment. While some governments recognize this, others have yet to be persuaded that this is a proper use of public funds.

- **More home-based businesses will be served on their own premises**: Most incubation systems already provide services to selected clients within and outside their walls.

- **The twinning of incubators** with their counterparts abroad has been an effective means of technology transfer. Thus, Rensselaer Polytechnic Institute, New York, provided staff for a Kiev, Ukraine incubator, and Turkish and Uzbek programmes have been collaborating with the link of a common-root language. Such collaborative work is being intensified.

- **Pre-incubation of potential entrepreneurs**: Ideally entrepreneurs must start with their own innovative ideas, but many situations benefit from 'project profiles' from which they may choose and develop a business.

- **Private corporations and chambers of commerce** are beginning to take the incubation process seriously, based on demonstrations of mutual benefit. Further, corporate responsibility calls for focus on the 'triple bottom line' of economic, social and environmental sustainability.

- **TBI linkages to technical universities and research parks**: This has a growing potential of synergy.

- **There is a growing trend towards development of post-incubation programmes** to provide continuing support, including the development of strategic alliances with current clients and large enterprises/graduates.

- **More consideration is being given to implementation of hub and satellite systems** to provide economies of scale in incubator operations, and possibilities of development of franchising arrangements for greater outreach and enhanced professionalism.

- **As the world gets smaller, the trans-nationalization of business** will grow. Already software companies and call centres in far-flung countries are working round the clock in real time. This is now happening also with high-end research, health and legal and other professional services.

### Expansion and enhancement of incubators

The present 2,000 incubators in developing and transition countries can be expected to grow at the rate of about 5% annually, that is, roughly one or two new incubators established each week over the next 4 to 5 years. Such growth will come from:

- **Countries that are now planning or have recently started incubators**: These include: Morocco, Tunisia, the Syrian Arab Republic, Palestine, Lebanon, Jordan, Kenya, Kuwait, Bahrain, Senegal, the United Republic of Tanzania, Nigeria, Zimbabwe, Peru, Pakistan, Sri Lanka, Viet Nam, Slovenia, Thailand, the Islamic Republic of Iran, Ecuador, Albania, Bulgaria, United Arab Emirates, and several Central Asian countries.

- **Countries that are planning significant expansions**, for example: India, Malaysia, Indonesia, Romania, Ukraine, Russia, South Africa, Bulgaria, Kazakhstan, Uzbekistan and Mexico.

- **Major enhancements of the existing incubator operations that are underway**: such as in South Korea, Brazil, China, Taiwan, Japan, Turkey, Colombia, Egypt, Hungary, Latvia, the Czech Republic and Poland.

### Intra-national and international cooperation

The business incubator and its clients can benefit from cooperative arrangements with other incubators at all levels. In countries where both resources and the time to catch-up are limited, it makes good sense to exchange experiences and to learn both from the mistakes and the successes of others.
As incubators begin to come into operation, the need is felt for a forum to facilitate interaction. National and regional incubation associations are formed essentially to:

- assist existing operations and create new ones, through annual conferences, and training opportunities;
- compile and disseminate information on planned and ongoing activities;
- initiate programmes to upgrade incubation performance; and
- harmonize approaches and influence national policies towards a more supportive role for incubators and clients.

The power of the incubation associations has yet to be properly utilized. Many are still nascent, inadequately funded, and concerned with advocacy rather than with strengthening the whole industry. They have to be enabled to move up the service pyramid, as shown below, and to offer new types of services in order to transform the industry.

8. Help protect intellectual property
7. Develop improved incubator models
6. Mobilize donors: UN, Development Banks, EU
5. Build support among politicians and planners
4. Accredit incubators and managers for Quality
3. Link major associations in a world network – WIN!
2. Facilitate alliances, ‘soft landings’, and out-sourcing
1. Develop publications, conferences, training, statistics, advocacy

With heightened interest in internationalization among incubators and by linking the incubation websites, we could now move towards a World Federation of Incubation Associations – a world incubation network.

Associations are active in China (CASTIP) and Brazil (ANPROTEC), and have been formed in Indonesia (AIBI), Belarus (BIA), Kazakhstan (KABIC), Malaysia (NINA), Egypt (EIA) and India, each with its own orientation. In addition to incubator staffs communicating with each other, the tenant businesses also may benefit from the opportunity to mutually explore trade and technology partnerships.

The most active areas for industrial and industrializing countries to interact have been the regular conferences of the National Business Incubation Association (NBIA, USA), the European Business and Innovation Center Network (EBN, Brussels), the German Association of Technology Development Centers (ADT, Berlin), and the Innovation Centers in Eastern and Central Europe (ICECE). Also active on park-incubator collaborative issues are the International Association of Research Parks (IASP, Spain) and the Association of University-Related Research Parks (AURRP, USA). Each year, participation from industrializing countries has risen. These countries also are now able to access the international experience through web pages on the internet.

In industrial countries, the Australian and New Zealand Association of Business incubators (ANZABI), the Canadian Association of Business Incubators (CABI), the Italian Agency for Entrepreneurship Promotion (SPI), the British BIC and science park associations, and the newly formed Japan Association of New Business Incubation Organizations (JANBO) have been especially active.

The technology is available now and the need exists for incubator associations and their constituents to interact with each other through a World Incubation Network (WIN), which could become a truly WIN-win development.

**Multilateral support**

UNDP, and its UN Fund for Science and Technology for Development (UNFSTTD), have initiated incubator programmes in over 20 countries since 1987. From the outset, UNDP organized seminars for planners to meet on incubator issues at Libreville, Gabon (1988); Ife, Nigeria (1990); and Beijing, China (1991). Milestone events in stimulating cooperation among industrializing countries included the Inter-Regional Workshop on the Creation of Technology-Based Enterprises, Cuernavaca, Mexico, November 1991, and the Tianjin Inter-Regional Workshop, September 1995.

The United Nations Industrial Development Organisation (UNIDO) has provided significant help through its ‘Practical Guidelines for Business Incubators and Financial Planning’ software. UNESCO through its university–science–industry linkage programme is promoting university-affiliated incubators.

The World Bank infoDev programme has launched a major incubator initiative based on a trust fund contribution from the Government of Japan. This comprises an Incubator Support Center as well as grants for enhancing performance of existing incubators and establishing new incubators in developing countries. The International
Finance Corporation, the European Bank for Reconstruction and Development, and other regional banks have shown interest from time to time.

European programmes, such as the Columbus Project, have helped train Latin American incubator managers. Both EC-PHARE and USAID have provided significant assistance to Central and Eastern Europe and former Soviet Union countries. The extent of German collaboration with Central and Eastern European countries is extensive, comprising joint technology parks and twinned incubators.

The incubation system, as we know it today, may well be transformed by ICTs, emerging in a new form – a clustering wherein the whole community, with all its knowledge and financing capabilities, becomes a total nurturing environment.


Gerl, E. 2000. *Bricks and Mortar: Renovating or building a business incubation facility*. Athens, Ohio, NBIA.


Annex 1: Incubator developments in selected countries

The brief summaries below give an idea of the state of incubation developments in selected countries. The numbers of incubators given for each country should be understood as estimates, as the definition of what constitutes an ‘incubator’ varies and situations are changing quite rapidly.

Rapid incubator growth in China

Since the start of the programme in 1987 with assistance from the United Nations Development Programme, China has developed over 450 incubators and incubator variants, the largest such programme in the industrializing countries. Reportedly, state investments in incubation total more than US$1 billion. Difficulties have been encountered, such as insufficient assistance to tenant companies, low levels of local technological development, inadequate finance for clients, and weak incubator management. The tendency has been to expand the real estate with state finance, to the neglect of support services for clients.

Incubators in China are generally non-profit state-owned corporations, reporting to some combination of the provincial/municipal Science and Technology Committees and of the local economic development zone. While the Ministry of Science and Technology’s TORCH programme provided policy guidelines, the management responsibility is left to the local agencies. Two-thirds of the entrepreneurs come from adjacent universities and technical institutes. The local government often offers free land to help reduce capital costs, while flexibility in leasing part of the rentable space for commercial purposes helps raise operating revenues.

Interestingly, incubator management teams have recently begun taking equity in their client companies (as in the Wuhan incubator), which enables them to better assess the value of innovations. One incubator manager put it this way: ‘We no longer want to come to the incubator on bicycles and see our clients go home in BMW cars. We are willing to share the risks and the rewards.’

While the spontaneous clustering of like-minded producers of traditional goods and services has existed for centuries in many developing countries, what is new is the usefulness of such cooperation/competition (or ‘coop-petition’) in advanced technologies. Good examples are the Zhongguancun Science Park in Beijing, linked to the Beijing and Tsinghua Universities, and the agglomeration of informatics-related activities along the highway from Shanghai to Suzhou.

The China programme continues to evolve. There has been a willingness to learn from mistakes and from the experience of other countries. It is changing its operating style from a ‘Socialist incubator’ to a ‘market incubator with Chinese characteristics’.
A strong university–incubator nexus in the Republic of Korea

The Korean economy has grown rapidly, with per capita income rising on average 6.8% annually between 1966 and 1996, when it became an OECD member. The financial crisis in 1997 and the International Monetary Fund (IMF) ‘bail-out’ had profound impacts on the pattern of business and the pace of new venture creation. Given the spectre of global recession, a World Bank-OECD study calls for urgent action on increasing productivity; becoming more internationalized, including opening up to more foreign investment and trade, and moving away from past government interventionist policies and overregulation.

With the decline of the old conglomerates and the distrust of financial institutions, investors have moved into entrepreneurial start-ups, now called ‘certified venture firms’. These are defined for administrative purposes as businesses with significant R & D activity (over 5% of sales) and some venture capital (more than 10%), with products and services based on commercializing their own or publicly-funded research results.

Although the first Korean incubator was started in 1993, the major expansion has taken place in the last five years. There are about 300 incubators in operation and under implementation today, with plans for many more. Most are under the Small and Medium Business Administration, the Ministry of Commerce, Industry and Energy, and the Ministry of Information and Communication. The majority (over 85%) are affiliated to universities. Half the client businesses are in internet and software-related work, about 14% in equipment and instruments, and 11% in biotechnology. Presently, there are about 3,700 tenant companies and 1,200 graduates, with a total of over 21,000 employees in these incubators. The average area per incubator is 1,700 m², each with about 15 clients.

A technology incubator focused on enhanced business services is sponsored by the Ministry of Science and Technology at the Korean Advanced Institute of Science and Technology, in Taedok Science Town. Its strategic vision includes a Competitive Technology Assessment Center to evaluate the market potential of the innovation.

The problems encountered by incubators in Korea, as in other developing countries, are:

- the scarcity of trained managers and need for operating systems
- inadequate support services for clients
- poor specialization among incubators based on regional characteristics
- limited experience in valuation and structuring for advanced-tech ventures
- the inadequacy of finance for incubators and clients, despite the good venture capital activities
- the need for promotion of the incubation modality through success stories.

A major drive is underway on the ‘professionalization of incubator staff’. The Korea Business Incubation Association is addressing these issues.

Technology business incubators in India

Among developing countries, India had an early start in the 1950s on building comprehensive state-supported programmes for small business support, scientific research and entrepreneurship development. India’s IT industry presently employs over 800,000 people, with an annual output of US$10 billion. Growth is projected to reach an annual output of US$77 billion and to create a total of 2 million jobs. Business outsourcing has moved to higher-end consulting and research services.

Today, there are over sixty incubator-variants, including the technology incubators at the renowned Indian Institutes of Technology in New Delhi, Mumbai, Khargpur and Chennai. At Hyderabad, the Government of India’s Materials Research Center has initiated the Advanced Materials Technology Incubator (AMTI) on its campus, to assist entrepreneurs to commercialize its research results. In Pune, near Mumbai, IndiaCo, linked to a seed venture financing facility, supports web-based eServices, enterprise software products, nano-technology and other technology growth areas.

5. ‘The present condition of KOBIA’, NBIA Conference, San Jose, April 2001.
The fifteen Science and Technology Entrepreneurs Parks (STEPs) are similar to TBIs. These are located at technical universities, sponsored by the Government’s Department of Science and Technology. The STEPs are being refurbished and staff skills being upgraded, to become more helpful to graduate students and others seeking self-employment.

The Government’s Department of Electronics has set up the Software Technology Parks (STP-I) Programme, to help strengthen the ‘India software advantage’. The thirty-six STPs essentially support software companies. Through a ‘single-point contact’ for regulatory functions, the sponsor can obtain duty-free imports of equipment, custom-bonded warehouses for materials, income-tax exemptions for five years, and the repatriation of know-how fees and royalties, in order to develop and export software.

Uzbekistan

With political support from the State Committee for State Property Management and Entrepreneurship Support (GKI) and initial UNDP/UNIDO assistance, two pilot incubators were started at Tashkent and one at Samarkand in 1995. The process from the first consultant study to the entry of first batch of clients took 9 months – a relatively short duration given the adverse conditions of an economy just beginning the transition to a market system. The programme is reported to have served about 245 companies, created 2,800 jobs, and trained 12,000 persons.

In 1996, the Republic Business Incubator Network was initiated, and has been expanded to about 20 incubators; of these about half are functioning as proper incubators, mostly in agribusinesses. The programme’s main purposes are to promote technology commercialization, to develop a supportive legal environment and business infrastructure for start-ups, and to train entrepreneurs in the skills needed by a market economy. Uzbekistan provides a good example of strong state support and effective donor intervention. The programme is used to leverage small-enterprise friendly policies.

South Africa

For many years, RSA has had a network of facilities called ‘hives of industry’, established by the Small Business Development Corporation. State agencies (NTSIKA and KHULA) are establishing local industrial parks comprising incubators and multi-tenant buildings.

Today, unemployment has turned into a severe problem, with over half a million jobs lost in the past five years. To help provide alternative livelihoods to their laid-off employees, South African Breweries, in a joint-effort with the Food and Allied Workers Union, initiated Project Noah. Its mission is to proactively assist in developing business and vocational skills, and to support outplacement. As part of Project Noah, a business incubator has been started at Isando, near the Johannesburg airport. The low skills level of workers is a major constraint to new business creation. Incubator developments are underway in Kimberley, Bloemfontein, Welcom, Natal, and the Council for Scientific and Industrial Research. A network of three major Biotechnology Regional Innovation Centers has been launched in Cape Town, Pretoria and Durban.

The GODISA programme, supported by the South African Department of Science and Technology, the Department of Trade and Industry and the European Union, is establishing a dozen incubators/innovation support centres as well as an incubator association. Godisa is a Setswana word meaning ‘nurturing or helping to grow’.

The objective is to create new technology-intensive enterprises, and to enhance the capacity of small enterprises to face the demand of a modernizing economy.

Malaysia: linkages to technology parks and research institutes

The Industrial Master Plan (1996–2005), in the context of the government’s Vision 2020 programme, recognizes the imperative of creating a competitive small enterprise sector. This calls for developing the technical infrastructure, supportive policies, investments and tax incentives for research and human resource development, structures for university–business
linkages, financing of instruments for innovation, and the continued support to technology incubators. Importantly, it requires major schemes for the development of incubator managers.

Having started in the early 1990s, Technology Park Malaysia is strategically located on 800 acres near Kuala Lumpur. It presently has about 100 companies, of which many specialize in ICT. The system comprises an Innovation House to help initiate start-ups, an Incubator Center for early-stage ventures, and Enterprise Houses for those graduating to good industrial space. The congruence of support includes a Resource Center, Master Center (for rapid proto-typing, flexible manufacturing, and robotics), IT-Multimedia Center, TPM Academy for advanced training together R & D plots.

The Kulim High Technology Park, envisioned to be the ‘Science City of the Future’, has its own incubator. Multi-Media Super Corridor has an incubator at Cyberjaya. University-affiliated incubators now operate at University Sains, University Putra, National University, and the Technology University of Malaysia. The Malaysian Technology Development Corporation has established technology development centres to facilitate university–research–business collaboration in specific sectors. The venture capital industry, essentially state-sponsored, has grown rapidly.

The SIRIM incubation system integrates quality research and its commercialization, through the entrepreneur development, enterprise creation and market development phases. It operates at its main campus and six satellite incubators.

The relative success of the Malaysian incubation programme to date is due in large measure to the convergence of services offered and to continuing government support – an emerging triple-helix of university, state and business collaboration. The problems to be tackled are: raising scientific research productivity and technological innovation, developing (and keeping) good incubator managers, promoting an entrepreneurial culture, and transiting from dependence on government subsidy to reasonable sustainability.

**Brazil: rapid growth with strong state support**

Incubators began in Brazil in the mid-1980s, through an initiative by the National Scientific and Technological Development Council (CNPq), and growth accelerated after 1993. Brazil has over 250 business incubators (2004), most in the south-east, with the objectives of economic development, technology commercialization and employment generation. The clients are mainly in computing software and electronics, and others in services, biotechnology and chemistry, mechanics, food products and other categories.

The incubation industry is well supported by the Service for Support to Micro and Small Business (SEBRAE), with the National Association of Institutions Promoting Advanced Technology Ventures (ANPROTEC). The Program for Human Resources for Technology Development (RHAE), as well as the Studies and Projects Financing Agency (FINEP), the National Bank (BNDESPAR) and state funds such as FAPEMIG also provide financing. Further government agencies support bolsistas – student interns assigned to work with incubator firms.

More than 30 universities in Brazil, covering one-fifth of all college students, participate in incubator projects, mainly in technological fields. Among the largest sponsors of incubators are federal or state agencies (52%) and private not-for-profit or for-profit organizations such as the Federation of Industries Sao Paulo (40% of total).

**Egypt: fair progress and good potential**

In its transition to a market economy, Egypt has experienced high unemployment rates, especially among college graduates and former state staff. At the same time, support services and finance for small business were inadequate. Starting as a UNDP initiative in 1992, the Social Fund for Development of the Government of Egypt has established a major network of incubators as a component of its extensive small business development and employment generation programmes. Implementation is being undertaken by the Egyptian Incubator Association, an NGO set up in 1995 for this purpose.

A business incubator started operations at Tala in the Nile Delta in March 1998, followed by a National Master
Plan based on sets of parameters, in order to prioritize locations from Aswan to Alexandria. Incubators have now been established in Mansura, Assiut, Tabin, Benha, Fayoum, Giza, Aswan, Gharbiya, Beni Souf, Duweka, the Sinai region and the Mubarak Science City. These include mixed business, industrial and technology-based businesses. Today over a dozen incubators are in operation and many more are under implementation.

The Social Fund has been supportive in funding the incubator programme. The severe problems encountered include finding (and properly remunerating) the managers, delays due to state regulations, inadequate delegation of governance to local authorities, identifying entrepreneurial growth-potential entrepreneurs, and networking with external service providers. A major entrepreneurship development programme is to train 7,500 graduates annually in 40 centres.

**Turkey**

Turkey started a technology incubator programme in 1990 (still referred to as Technoparks). Today, KOSGEB, the state small enterprise support agency, provides the full financing for a dozen incubators linked to technical universities. Research projects by client-companies are also supported by the state. Rents and fees are low (and go directly to KOSGEB, giving little incentive to the managers to improve their performance or to cover their costs).

**Poland**

UNDP technical assistance in 1990 helped pioneer the concept of incubators in Poland, starting with the first incubator in Poznan. The creation in 1992 of the Association of Polish Business Incubators and Innovation Centres became the catalyst for growth. Whereas earlier the incubators focused on technology commercialization, since 1993 programmes aimed at creating employment and restructuring the Polish economy, with support from the World Bank and the EU.

Currently there are about 65 incubators. They have helped start over 1,500 firms and created more than 6,000 jobs. The average size of the incubators is about 2,500 m² (space for rent = 1,790 m²), with 18 clients each. Investment has been under US$500,000 per incubator. In a difficult environment for transforming the economic system, Poland has effectively adapted the concept of incubation.

The problems of finding local funds, good managers, appropriate building space, entrepreneurial ‘incubatees’ and links to professional service providers continue. These problems are not uncommon in emerging and developing economies. At the same time, there is now a better appreciation of the potentials and prerequisites and a continuing expansion.

Furthermore, in several small countries there is significant progress in establishing advanced technology-based facilities, such as the *Panama* Technology Business Accelerator, the *Dubai* Ideas Oasis, ConceptNursery in *Sri Lanka*, and the Technology Innovation Center at University of Technology, *Jamaica*.

**The German experience**

In moves to catch up and surpass the US, the European Union – together with federal, state and city governments – has actively promoted innovation. There are now around 1,000 innovation centres and incubators in Europe.

In Germany, based on its strong technical education and research infrastructure, TBIs have been an important instrument of regional development and technology commercialization. Having started in 1983, Germany now has over 200 ‘technology centres and business incubators’. These support some 6,500 ventures, research institutes and service companies, with a total of 42,000 employees. On average, each German incubator has 5,400 m² of space, 25 companies and 200 employees.

After German unification in 1990, the incubation centres in eastern Germany have grown rapidly to about 65, representing 4 incubators for every 1 million inhabitants (as against 1 incubator for every 1 million in western Germany). Early differences between them are now disappearing.
Of the technology incubators, roughly half are linked to universities and one-third to technology parks. The main concerns of the TBIs are providing good support and access to finance, and promoting academic spin-offs. The technology orientation of firms has dropped from 90% to below 70%. The focus has up to now been in information technologies (75%) and software (67%). Ownership is often in the form of a limited liability company (a GmbH), with participation by the host town, chamber of commerce or bank.

The US incubator programme

TBI sponsorship and operations in the industrialized countries of Europe and North America show similarities but also many differences. US incubation programmes usually start as local initiatives by economic development agencies. Following the initial preparations, federal agencies – such as the US Department of Commerce and Economic Development Administration and the Departments of Housing and Urban Development, Health and Human Services and Agriculture – are approached, as well as regional development authorities. Federal funding is usually limited to preparation and construction costs and research grants for client companies. Thus, most management teams have to spend considerable time and effort in raising supplementary operational financing. Legislation under the Linking Education and Developing Entrepreneurs for Reaching Success programme seeks to provide US$60 million through competitive grants to university-affiliated incubators for preparatory work.

US incubator programme types and operating expenses

The National Business Incubation Association and its committees provide a variety of training, publications, statistics, conferences and advocacy services. The 1998 survey of business incubation by NBIA indicates that current clients and graduates of North American incubators have added some 19,000 viable companies and 245,000 jobs. The average incubator is around 40,000 ft.², has 24 client companies, and has graduated 20 enterprises in about six years.

The US programme is the world’s largest, with over 1,000 incubators (2004). Today, the bulk of its incubators are mixed-use (47%), followed by technology-based (37%), manufacturing (7%), service (6%) and other (4%). The average annual operating costs for technology incubators (US$567,081) are more than twice that for service and mixed-use incubators (see Figure 10).

At the technology incubators, the services most in demand were networking assistance and access to IT services, followed by mentoring, linkage to strategic partners and business plan assistance. Marketing, university linkages and management development were of lower priority.

Figure 10: US incubator programme types and operating expenses
## Annex 2: Technopreneur profile survey

### A. General

1. Name ___________________ Gender: Male ___ Female ___
2. Address _____________________________
3. Telephone ___________________ Fax ___________________ Email _____________________________
4. Education Training
   - Secondary ________________ Postgraduate ________________
   - University ________________ Other ________________
5. Business Activity
   - Type of Business
     - Service ________________
     - Manufacturing ________________
     - Commerce ________________
     - Specify: _____________________________
6. Preparation Phase
   - Early concept ________________ Business plan in place ________________
   - Prototype ________________ Help needed ________________
   - Operations started ________________ Funding being sought ________________
   - Business failed ________________
7. If in business, give name and type of activity. _____________________________
8. Entrepreneur activity/business started by close family member. Yes ___ No ___
9. If Yes, state name and type of business.
    - Under US$100,000 ________ Housing
    - US$101,000 – 300,000 ________ Owns ________
    - US$301,000 – 500,000 ________ Rents ________
    - US$500,000 – 1,000,000 ________ Leases ________

### B. Obstacles being encountered

<table>
<thead>
<tr>
<th>Type of difficulty</th>
<th>Degree to which experienced (5 being 'Most')</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to credit</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Affordable work space</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Equipment work space</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Management/other training</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Government bureaucracy</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Marketing</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Access to markets</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Technology/research support</td>
<td>1    2   3   4  5</td>
</tr>
<tr>
<td>Other</td>
<td>1    2   3   4  5</td>
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</tbody>
</table>
C. **Services needed from Technology Business Incubator**

Which of the following services would you require when the TBI is ready for occupancy?

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<thead>
<tr>
<th>Affordable work space</th>
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<tr>
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<td>250 ft.²</td>
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<tr>
<td>500 ft.²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Entrepreneurial development
Marketing
Business counselling/advice
Technology/research support
Access to financing / funds
Management/other training
Export/marketing assistance
Network contacts
Information services
Access to equipment

Type of equipment

Interviewed by: ___________________________ Date: ___________________________
Annex 3: Incubator site and building evaluation

Location:   
Owner:  
Zoning:  

Plot Size:  
Soil:  

Buildings:  
No.:  Size(s):  
Comment:  

Elevation:  
Highest:  m  Lowest:  m  Range:  m  

Drainage:  
Distance to:  
Road:  m  Rail:  m  Seaport:  m  Airport:  m  
Comments:  

Mass Transit:  m  Business Center:  m  
Comments:  

Residential Housing:  m  University:  m  
Comments:  

Utilities:  
<table>
<thead>
<tr>
<th>Type</th>
<th>Cost</th>
<th>Specs</th>
<th>Quantity</th>
<th>Comment</th>
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<tbody>
<tr>
<td>Electricity</td>
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<td>Telephone</td>
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<tr>
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<tr>
<td>Industrial</td>
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<tr>
<td>Potable</td>
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<tr>
<td>Sewage</td>
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</tr>
</tbody>
</table>

Hazardous Waste:  

Local Infrastructure:  

Accounting:  
Advertising:  
Attorney:  
Consultants:  
Business:  
Technical:  
Distribution:  
Manufacturing:  
Office Services:  
Printing:  
Research:  

Site Diagram (please attach map)  
Building Floor Plan (please attach)
## Incubator Building Evaluation

<table>
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<tr>
<th>Address:</th>
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<tbody>
<tr>
<td>Description:</td>
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<tr>
<td>Condition:</td>
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</table>

### Site

<table>
<thead>
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<th>Size: m²</th>
<th>Adjacent: m²</th>
<th>Fenced:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (m²):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross m²</td>
<td>Net m²</td>
<td></td>
</tr>
<tr>
<td>Office:</td>
<td>Warehouse:</td>
<td>Factory:</td>
</tr>
<tr>
<td>Construction:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall:</td>
<td>Ceiling:</td>
<td>Roof:</td>
</tr>
<tr>
<td>Dimensions:</td>
<td></td>
<td>Floor:</td>
</tr>
<tr>
<td>Exterior finish:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor thickness:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fenced:</td>
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<td></td>
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</tbody>
</table>

### Clearances

<table>
<thead>
<tr>
<th>Clear span:</th>
<th>Ceiling height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay size:</td>
<td></td>
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<td>Column spacing:</td>
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### Characteristics

<table>
<thead>
<tr>
<th>Doors:</th>
<th>Drive-in door:</th>
<th>Dock doors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dock height:</td>
<td></td>
<td>Rail doors:</td>
</tr>
<tr>
<td>Parking spaces:</td>
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### Heating Type

<table>
<thead>
<tr>
<th>Heating Type:</th>
<th>Boiler:</th>
<th>Air conditioning:</th>
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### Features

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<tr>
<th>Features:</th>
<th>Sprinkler system:</th>
<th>Cold room:</th>
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<tbody>
<tr>
<td>Overhead crane:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freezer room:</td>
<td></td>
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</tr>
<tr>
<td>Security system:</td>
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### Utilities

<table>
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<tr>
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<th>Capacity:</th>
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<tbody>
<tr>
<td>Electrical:</td>
<td>Provider:</td>
<td></td>
</tr>
<tr>
<td>Gas:</td>
<td>Provider:</td>
<td></td>
</tr>
<tr>
<td>Water:</td>
<td>Provider:</td>
<td></td>
</tr>
<tr>
<td>Sewer:</td>
<td>Provider:</td>
<td></td>
</tr>
<tr>
<td>Telephone:</td>
<td>Provider:</td>
<td></td>
</tr>
<tr>
<td>Internet:</td>
<td>Provider:</td>
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### Transportation

<table>
<thead>
<tr>
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<th>Highway:</th>
<th>Air Freight:</th>
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<tbody>
<tr>
<td>Rail:</td>
<td>Carrier:</td>
<td>Barge:</td>
</tr>
<tr>
<td>Fire Rating:</td>
<td>Service:</td>
<td>Distance to service:</td>
</tr>
<tr>
<td>Taxes:</td>
<td></td>
<td></td>
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</table>

### Owner

<table>
<thead>
<tr>
<th>Owner:</th>
<th>Broker:</th>
</tr>
</thead>
</table>

### Address

<table>
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<tr>
<th>Address:</th>
<th>Address:</th>
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</table>

### Telephone

<table>
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<tr>
<th>Telephone:</th>
<th>Telephone:</th>
</tr>
</thead>
</table>

### Fax

<table>
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<th>Fax:</th>
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</thead>
</table>

### Email

<table>
<thead>
<tr>
<th>Email:</th>
<th>Email:</th>
</tr>
</thead>
</table>
Annex 4: Layout of the Ben Craig Center, Charlotte, NC

THE BEN CRAIG CENTER
1st Floor

- Medical optical Imaging
  Suite 110

- Bridge Builder Company
  Suite 108

- Frontline Consulting Service
  Suite 112

- Choice Translating
  Suite 116

- Carolina Joint Medical
  Suite 118

- Kitchen

- Seminar Room #1

- Seminar Room #2

- Optinfo
  Suite 120

- Suit 122

- Suite 124

- Warehouse

- Suite 128
  Pharmaceutical (Clinics)

- Suite 130

- Suite 132

- Suite 134

- VMII
  Suite 135

- Vandercook
  Suite 136

- Data Disc Corporation
  Suite 138

- First Data Merchant
  Suite 140

- Front Lobby

- The Ben Craig Center and SBTDC Offices
  Suite 100
Annex 5: Broad criteria for the selection of entrepreneurs

Identifying the entrepreneur

The process of identification of entrepreneurs involves determining how to contact them, and interviewing them, using the Technopreneur profile survey. The demand/market survey is to help determine roughly their number, their possible needs and how the incubator can help them meet these needs. The assistance needed by entrepreneurs may vary from site to site and depends upon the nature and type of incubator, for example, whether the focus is on technology, small- and medium-sized enterprises, or regional development.

Entrepreneurs to be interviewed may come from many sources. When incubators start up, they often seek existing small businesses that may wish to relocate to the incubator. For new businesses, the technically-oriented entrepreneurs are likely to come from research facilities, engineering and science universities, or technically oriented businesses. Industrial parks may also provide opportunities to find entrepreneurs. Once operating, the existing clientele may provide the majority of new leads.

Management

As management is the most important criterion for success, incubators require a balanced team with experience in the business. A team is preferred since the wide range of skills needed to grow a business rapidly is seldom found in one person, although the company may only involve one person initially. The incubator director may, initially, supplement some of the skills necessary, and training programmes will help develop the capabilities of the entrepreneur. The incubator should seek entrepreneurs with good ‘people skills’ – that is, someone with the ability to work well with others – who is able to delegate authority, and who has a network of contacts that is well developed and accessible.

Market

A readily identifiable market with the potential for rapid growth is ideal, since this provides an opportunity for competitive entry. The entrepreneur should know who the customers are, how to reach them and secure a large market. There should be high value added, and gross margins of 40% or more.

Competitive advantages for the product should exist; and the company should be able to gain IP protection through patents or proprietary processes. Production costs should be low and quality high.

Financing

Profit after tax should be above 10%. Time to break-even and to produce positive cash flow should be under, say, two years. Return on investment should be substantially above prevailing interest rates. Capital requirements should be low to moderate: something that the incubator will be able to arrange funding for. Also, there must be some envisioned method to ‘cash out’ or to have the investment liquidated.
Annex 6: Checklist for business plan assessment

I. Business description

- type of business you are planning
- products or services
- type of opportunity (new, part-time, expansion, seasonal, year-round)
- keys for success
- growth potential
- uniqueness
- strengths and weaknesses

II. Marketing

- potential customers
- size and growth of the market
- major competitors (How are their businesses prospering?)
- sales promotion plans
- anticipated market share
- pricing
- advertising
- strengths and weaknesses

III. Research, design and development

- design or development
- technical assistance
- research needs
- costs relative to competitors
- strengths and weaknesses

IV. Manufacturing

- location (what influenced the choice of location?)
- needs for production, e.g. facilities and equipment
- key suppliers
- available transportation
- local supply of available labour
- manufacturing costs
- strengths and weaknesses

V. Management

- key management staff qualifications
- number of employees needed
- key functions
- plans for employee salaries or wages and benefits
- consultants or specialists needed (when and why)
- legal form of ownership (and why)
- licenses and permits
- key regulations
- strengths and weaknesses
VI. Critical Risks

- potential problems
- major obstacles to success
- alternative courses of action
- strengths and weaknesses

VII. Financial

- estimated business income for the first year, by month
- what will it cost you to open the business?
- monthly cash flow for the first year, by month
- personal monthly financial needs
- annual sales volume to make a profit during the first three years
- lowest annual sales level at which you will make a profit
- pre-opening financial condition (projected assets, liabilities and net worth)
- total financial needs for the first three years
- potential funding sources
- use of funds from lenders and investors
- security for loans
- strengths and weaknesses

VIII. Milestones

- how many months to sustainability?
- what are the deadlines for each stage of business development?
- what are your key objectives in the next three years?
- strengths and weaknesses

IX. Annex

- attach documents, drawings, agreements, or other materials needed to support your plan
- attach names of references, advisers, or technical sources
- other supporting documents
- strengths and weaknesses

X. Marketing Checklist

- How will your customers use your products/services?
- What are your customers’ basic buying considerations with regard to:
  - price
  - service
  - engineering
  - right of return or consignment
  - quality
  - availability
  - credit terms
  - past and prospective patterns of product changes in your industry
- What are new uses for your products?
- Describe related products or industry segments you are not now serving.
- What warranty terms are customarily offered, and what is their cost?
Have you given thought to the following?
- product liability issues
- trade secret
- patent
- intellectual property protection
- trade/service mark

What is your assessment of the nature of demand (basic/created)?

What are your key customer characteristics?

Have you given thought to the role of the following – and their needs/expectations?
- individual consumers
- service buyers
- government buyers
- wholesalers
- industrial buyers
- commercial buyers
- retailers

How would you describe your assessment of the market?
- early
- mature
- growth
- vintage

Describe the major foreign markets (identity and size)

Discuss the following factors’ effects on demand:
- population changes
- new products, product changes or technological innovations
- customer growth
- ecological considerations
- general business conditions
- governmental factors (e.g. fiscal policy, import/export controls, defence activity)
- energy availability

How much can market be expanded by your company?

Discuss the market segmented by:
- customer characteristics
- product characteristics
- geographical locations
- channel of distributions

Pricing policy

How will you develop market segmentation?

What are the seasonal sales patterns and anticipated shifts?

What is the record of product sales performance?

Date the product was (will be) introduced / any significant modifications

What is the projection of growth or contraction trends for the product lines?

What is the forecast of the following, by year for the next five years?
- sales expectations
- market share of competitors
- sales backlog, receivables

What is the total competitive capacity, by year for the next five years?

Attach an assessment of principal competitors and competitive practices, including product, technology and financial aspects.

Attach pricing policies analysis for key product lines.

What is the sensitivity of both you and your competitors to price changes?
• Who is the price leader? Is good price discipline practiced?
• What excess capacity in the industry might tend to depress prices?
• Will you be able to pass along cost increases to customers?
• Attach an analysis of potential domestic and export customers, including:
  • the total number, major types of customers and estimated sales
  • the geographical locations and estimated sales by location
• Who are the potential principal customers? What is the annual volume of sales and their buying habits?
• What are your proposed contractual relationships with customers?
• Describe government contracting subject to cost regulations or price re-determination
• What special discounts and credit terms are to be offered to significant customers?
• What are the methods companies in the industry use to distribute and sell, including?
  • channels of distribution and annual volume
  • conditions in customers' markets of product in each channel
  • the nature and importance of the field sales effort
  • the manner of compensating sales personnel
  • changing patterns in the distribution process
  • advertising and sales promotion practices in this industry
  • trends among major customers towards integrating, purchasing substitute products or otherwise deviating from existing purchasing habits?
• What is the cost of advertising appeals, media and other sales promotion?
• What is your analysis of distribution and selling costs?
• Describe marketing methods relating to foreign sales.
• Review the major elements of marketing, including:
  • market forecasts
  • departmental costs
  • sales and expenses per sales professional
• What are the customer service costs, and the order processing costs?
• What is the discount pattern by customer groupings?
• Who are your key customers, and what is the (intended) total volume of sales, by year for the next three years?

Adapted from: 'Checking into an Acquisition Candidate', Coopers & Lybrand
Annex 7: Application for admission to the incubator programme

The incubator should develop its own application forms, taking into account some of the points below:

The information in this application will be used only to evaluate the eligibility of the applicant for participation in the programme. Access to the information will be restricted to the incubator management team and to staff involved in the review process.

Name of Company: ___________________________________________________________

Street Address: ______________________________________________________________

City & State: ______________________________ Telephone: _______________________

Date of Application: ______________________________

**Major Expectations from Incubator Programme**

Space Requirement: (in square metres)

Date of Entry:

Support Needs:

**Company Information**

Business Concept:

Customers:

Management Team:

**Legal form of business entity:**

Attach a copy of the papers and company bylaws and associated documenting legal status of the business entity.

**Company Ownership (owners and per cent ownership)**

Name and Title of Firm __________________________________ % Ownership __________

**Three business references and three personal references in format below**

Name:

Address:

Telephone and email:
Attach the following:

Business Plan
Financial Statements (past three years)
Enterprise Tax Return (past three years)
Personal Tax Return (all officers, past three years)

Applicant’s Statement

Applicant hereby certifies that the information and statements contained in this application or attached hereto are true and correct, and are provided for the purpose of gaining admission to the business incubator programme. The Applicant authorizes the Incubator management team to investigate this information by contacting its references and otherwise checking the applicant’s background. The Applicant authorizes any person or agency to provide the Incubator with any information that it may have or obtain in response to such inquiries.

Acknowledgment and Release

_________________________________________ (Applicant) acknowledges that the Incubator Programme has or will provide, directly or in conjunction with other parties (consultants and volunteers), business assistance, technical assistance, funding assistance, education and business networking, office/business services, consulting and other services. In recognition of Incubator’s non-profit status and reduced fee structure, and as additional consideration for Incubator’s providing Programme Services, the Applicant agrees to release, remise and discharge the Incubator (and its directors, officers, employees, consultants and volunteers) from any and all liabilities, obligations, claims, demands, causes of action, suits, damages, costs, expenses and compensation of every kind and nature whatsoever, known or unknown, direct or indirect, which the Applicant now has, may have had, or could have asserted against the Incubator for, on account of, or in consequence of all transactions and dealings by, between or among the Incubator and the Applicant, including but not limited to the providing of Programme Services.

IN WITNESS WHEREOF, this Statement and release is made this _______ day of ________________, 200__.

IN THE PRESENCE OF:

Name ______________________________ Title ______________________________

Witness Name __________________________

Witness Name __________________________
## Annex 8: Criteria for evaluating enterprise opportunities

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Higher Potential</th>
<th>Lower Potential</th>
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<tbody>
<tr>
<td><strong>Markets</strong></td>
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<td></td>
</tr>
<tr>
<td>– Need</td>
<td>Identified</td>
<td>Unfocused</td>
</tr>
<tr>
<td>– Customers</td>
<td>Reachable; receptive</td>
<td>Unreachable or loyal to others</td>
</tr>
<tr>
<td>– Payback to User</td>
<td>Less than one year</td>
<td>Three years plus</td>
</tr>
<tr>
<td>– Value added or created</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>– Product life</td>
<td>Durable; beyond time to recover investment plus profit</td>
<td>Perishable; less than time to recover investment</td>
</tr>
<tr>
<td>– Market structure</td>
<td>Imperfect competition or emerging industry</td>
<td>Strong competition or highly concentrated/mature industry</td>
</tr>
<tr>
<td>– Market size</td>
<td>US$100 million sales</td>
<td>Unknown</td>
</tr>
<tr>
<td>– Market growth rate</td>
<td>Growing at 30%–50% +</td>
<td>Contracting or less than 10%</td>
</tr>
<tr>
<td>– Gross margins</td>
<td>40%–50% or more; durable</td>
<td>Less than 20%; fragile</td>
</tr>
<tr>
<td>– Market share (5 year)</td>
<td>20% or more; leader</td>
<td>Less than 5%</td>
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<tr>
<td>– Cost structure</td>
<td>Lost-cost provider</td>
<td>Declining cost</td>
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<tr>
<td><strong>Economic harvest</strong></td>
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</tr>
<tr>
<td>Profits after tax</td>
<td>10–15% or more; durable</td>
<td>Less than 5%; fragile</td>
</tr>
<tr>
<td>Time to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Break even</td>
<td>Under 2 years</td>
<td>More than 3 years</td>
</tr>
<tr>
<td>– Positive cash flow</td>
<td>Under 2 years</td>
<td>More than 3 years</td>
</tr>
<tr>
<td>ROI potential</td>
<td>25% or more/year; high value</td>
<td>&lt; 15%–20%/year; low value</td>
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<tr>
<td>Value</td>
<td>High strategic value</td>
<td>Low strategic value</td>
</tr>
<tr>
<td>Capital requirements</td>
<td>Low to moderate; fundable</td>
<td>Very high; not fundable</td>
</tr>
<tr>
<td>Exit mechanism</td>
<td>Present harvest options</td>
<td>Undefined; illiquid investment</td>
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<tr>
<td><strong>Competitive advantage</strong></td>
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<tr>
<td>Fixed and variable costs:</td>
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<td></td>
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<tr>
<td>– Production</td>
<td>Lowest</td>
<td>Highest</td>
</tr>
<tr>
<td>– Marketing</td>
<td>Lowest</td>
<td>Highest</td>
</tr>
<tr>
<td>– Distribution</td>
<td>Lowest</td>
<td>Highest</td>
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<tr>
<td><strong>Degree of control:</strong></td>
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<tr>
<td>– Prices</td>
<td>Moderate to strong</td>
<td>Weak</td>
</tr>
<tr>
<td>– Costs</td>
<td>Moderate to strong</td>
<td>Weak</td>
</tr>
<tr>
<td>– Channels of resources</td>
<td>Moderate to strong</td>
<td>Weak</td>
</tr>
<tr>
<td>– Channels of distribution</td>
<td>Moderate to strong</td>
<td>Weak</td>
</tr>
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<td><strong>Barriers to entry:</strong></td>
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<td></td>
</tr>
<tr>
<td>– Proprietary protection, regulations advantage</td>
<td>Have or can gain</td>
<td>None</td>
</tr>
<tr>
<td>– Lead time advantage in technology, product</td>
<td>Have or can gain</td>
<td>None</td>
</tr>
<tr>
<td>– Contractual advantage</td>
<td>Proprietary or exclusivity</td>
<td>None</td>
</tr>
<tr>
<td>– Contacts and networks</td>
<td>Developed; high quality</td>
<td>Crude; limited; inaccessible</td>
</tr>
<tr>
<td><strong>Management team</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team</td>
<td>Existing, proven performance</td>
<td>Weak or solo entrepreneur</td>
</tr>
<tr>
<td>Competitor’s mind set</td>
<td>Competitive; few; not self-destructive</td>
<td>Dumb</td>
</tr>
<tr>
<td><strong>Fatal flaw issue</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatal Flaws</td>
<td>None</td>
<td>One or more</td>
</tr>
</tbody>
</table>
Annex 9: Client/tenant performance checklist

Company:
Entrepreneur:
Address:
Phone:

Business Concept
Business Plan including Projections

- Product(s)
- Credit
- Past Locations

Term desired:
- Month to Month
- 12 Months

Business Concept Review

- Company:
- Address
- Who will buy it?
- How much are they paying now?
- What is the purchase cycle?
- What experience do they bring?

- Entrepreneur:
- What is it?
- What are they buying now?
- What will they pay?
- Who is the management team?

Tenant Requirements:

Space (square metres):
- Office 1 / 2 / 3 shift
- Production 1 / 2 / 3 shift (describe)
- Laboratory 1 / 2 / 3 shift

Special Equipment:

- Maximum number / square metre
- Forklift Required:
- Dust / Vapour emission

Utilities

- Water
  - pressure
  - volume (est. litres/month)
- Compressed Air
- Electricity (estimated kilowatts/month)
  - 220V
  - 440V

Hazardous Materials:

- Biologically Active Agents (describe)
- Flammable Agents (describe)
- Solvents (describe)
- Explosive Agents (describe)

Services:
  (describe)
Special Requirements:
(describe)

Business Plan Review

Company:
• Concept
• Competition
• Tactics
• Financial history / Projections
• Risks
• Research & Development
• Administration
• Personnel

Entrepreneur:
• Market
• Management team
• Proposed financial structure
• What are the holes that need to be filled?
• Milestones
• Marketing
• Legal
• Measures of performance

Due Diligence Checklist

Company:
• Address:
• Review documents:
• Business plan
• Articles of Incorporation, Board minutes
• Investment summary
• Criminal history
• Patents/Copyrights
• Who, How Much, Form (documentation)

Entrepreneur:
• Phone/fax:
• Application
• Key management resume(s)
• Shareholder meeting minutes
• Debt summary
• Legal filings
• Other investors:

Investment Checklist

• Dates:
  Materials to enter
  Internal review completed
  Mail to committee
  Committee meeting
  Response to applicant

• Business summary
• Exit Strategy
• Financial
• Proposed structure
• Next step(s)

• Risks
• Recommendations
• Support
• Committee disposition
• Letter to entrepreneur
Closing Document Checklist

• Latest Business Plan
• Financial Instruments:
  Debt:
  Security:
    Appraised
    Insured/Secured
    Payment schedule
    Conversion (if any):
    Date(s)
  Condition(s)
• Warrants:
  Option date(s)
• Equity (Certificates)
• Repurchase agreement(s)
• Non complete agreement(s)
• Employment contracts

• Board Representation:
  Date effective
  Person assigned
  Reporting requirements:
    Frequency
    Content

• Closing Publicity:
  Responsible
  Date
  Monitoring:

• Measures of performance
• Trigger points & actions
• Key milestones/benchmarks
Annex 10: Schedule for incubator operating procedures

<table>
<thead>
<tr>
<th>A. Daily Operating Procedures</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>When</strong></td>
<td><strong>Who</strong></td>
<td><strong>What</strong></td>
</tr>
<tr>
<td><strong>Start</strong></td>
<td>Manager</td>
<td>Unlock Doors &amp; Turn on Lights</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check computers/printer/fax</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check tenant spaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review &amp; prioritize Needs</td>
</tr>
<tr>
<td><strong>End</strong></td>
<td></td>
<td>Check tenant spaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lock secondary doors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set night-lights &amp; security</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lock main door</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Weekly Operating Procedures</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tues</strong></td>
<td></td>
<td>Check consumables level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process re-stock order</td>
</tr>
<tr>
<td><strong>Wed</strong></td>
<td>Manager</td>
<td>Tenant Board of advisors</td>
</tr>
<tr>
<td><strong>Thus</strong></td>
<td></td>
<td>Tenant/management team meeting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Monthly Operating Procedures</th>
<th></th>
<th></th>
</tr>
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<td>Monthly Billing, excluding Rent</td>
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<td>Notices for Arrears w/Penalty</td>
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<td>Prepare and Distribute Rent/Services Bills</td>
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<th>D. Annual Operating Procedures</th>
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<td><strong>Dec</strong></td>
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Author’s biographical sketch

Rustam Lalkaka is President of Business & Technology Development Strategies LLC, New York, USA. He has been Director of the United Nations Fund for Science & Technology for Development (1980–89), UNIDO Industrial Development Advisor in Turkey (1976–79) and Regional Advisor on Technology Transfer for Asia and the Pacific at the UN Economic & Social Commission for Asia and the Pacific in Bangkok (1972–76). After completing his graduate studies in metallurgical engineering at Stanford University, California, he worked as a research metallurgist at the US Bureau of Mines at Boulder City, Nevada. On returning to India, he helped establish M.N. Dastur & Co. Ltd., a major steel plant engineering corporation, and managed its international affiliate out of Düsseldorf.

Mr Lalkaka has published a hundred papers and is the co-author of several books. Over the last four decades he has advised on technology strategies and venture creation in some forty countries, and is credited as the father of the technology incubator programme in China. He was a member of the US National Business Incubation Association’s committee on education and publications, and of its task force on international affairs. He is on the Board of the Foundation for International Training, Toronto, and Senior Research Fellow of the IC2 Institute, University of Texas. He has been awarded honours for pioneering work on strengthening technological capabilities, including the Honorary Memberships of the Polish Business and Innovation Centers Association, the Indian Institute of Metals, and the Twentieth Anniversary Award of Honor by the World Association of Industrial & Technological Research Organizations.

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Knowledge and technology have always driven social and economic development and are key to globalization and the growth of ‘knowledge societies’. Innovation and new technologies can have an impact at all levels – from commercializing R&D in hi-tech sectors to finding solutions such as improved water pumps and cooking stoves at the grass-roots level in developing countries. To maximize this potential, strong linkages must connect innovation, knowledge production and the diffusion of knowledge.

However, it remains easier to sell new electronic equipment to early adopters in rich countries than to introduce technology in developing countries to address the basic needs of poverty reduction, sustainable development and the other Millennium Development Goals. Helping to bridge the ‘digital divide’ – an important factor in development disparities and part of the larger knowledge gap between rich and poor countries – is one of the major international challenges we face today.

Many businesses around the world derive from technology. Some begin with an enterprising engineer, others when an entrepreneur spots a technological opportunity. Either way, all can benefit from advice and support in terms of technology business incubation. This is why UNESCO takes a particular interest in technological innovation and the incubator concept in business establishment and development.

This Toolkit begins by explaining what a technology business incubator is, followed by detailed chapters on planning, implementing, and operating an incubator. Using concrete examples and practical information, it outlines the process of setup; from the initial feasibility study and business plan; through choosing a location, planning the layout and finding sponsors; to selecting managers and tenants and monitoring incubator performance. Written by Rustam Lalkaka, a well-known expert in the field, this Toolkit provides invaluable information and teaching material on technology business incubation.