

‘Best Practices’ in Business Incubation: Lessons (yet to be) Learned

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Abstract

Business incubators, evolving from experiences with business centers and other support services, have grown rapidly in number from about 200 a decade ago to over 3,000 world-wide today. Incubator programs in the developing and restructuring countries are typically focused on technology ventures. But the interests of civil society call for the government, private sector and universities in all nations to address the wider concerns of empowering disadvantaged groups through employment and facilitated access to capital (human, knowledge, social and financial).

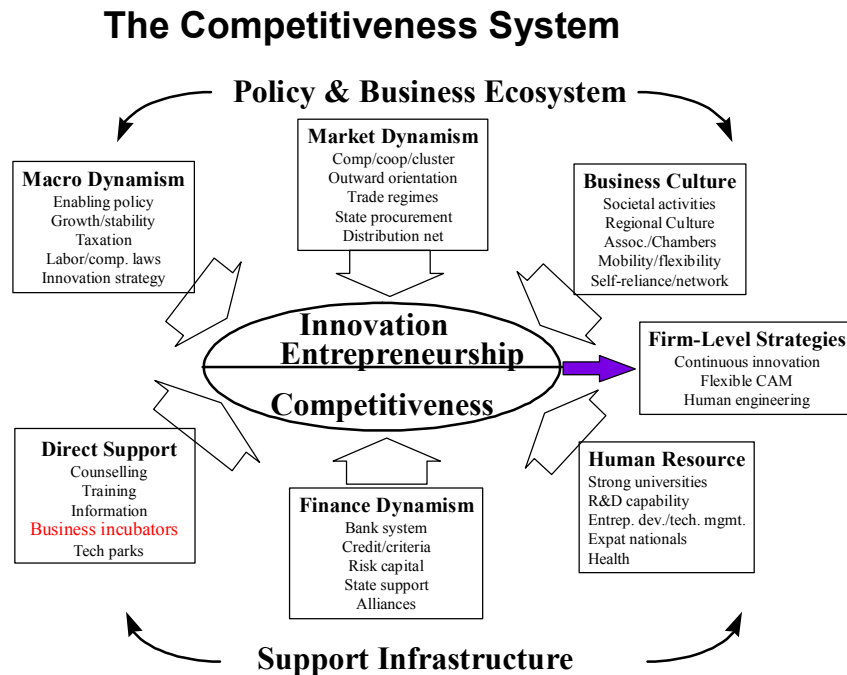
While incubators have grown in numbers, the uneven performance and poor sustainability in many situations have become serious issues with the governments and sponsors who continue to subsidize many of them. There has been much recent interest in identifying ‘best practices’ that could then be used elsewhere. But these practices are location-, culture- and time-specific, and can only be adapted to the conditions prevailing in local situations. This paper reviews the operating experiences in the USA, (which has about 1,000 incubators of the world total), in China, Brazil and Korea (the largest programs in the developing world), and other selected countries. The emerging lessons (yet to be learned) on enhancing performance based on ‘good’ international practices together with some urgent research issues are outlined. Success in the Olympiad of venture creation and employment generation depends essentially on five inter-linked rings: Public policy, private partnerships, knowledge affiliations, professional networking and community involvement.

Background

The countries today called ‘*developing*’ were at the forefront of applied science for about 2,000 years, from say 300 BC to 1770 AD, and many significant innovations moved from east to west. For the next 200 years following the industrial revolution, countries today called ‘*developed*’ began to pull ahead, technologically and thereby economically and militarily. And over the last 30 years, the pace and pattern of technical change has altered sharply, and many countries are being left even further behind. Nevertheless, a dozen industrializing countries now have the technical infrastructure and skills for major innovation; and for all the others, the advanced technologies -- adapted, applied, and absorbed – can help improve their lives.

Technological progress and entrepreneurship are dramatically changing the global economic landscape. These forces operate in the framework of open markets, government deregulation and privatization, together with fresh concerns for the human condition, good governance, environment preservation, gender balance, and growth with equity. The figure below indicates the support infrastructure and the policy-business eco-system within which companies, communities and countries must compete to win. Actions at the global, national and local levels call for a range of public-private partnerships among business, university and government.

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This study discusses the main characteristics of business incubation today, the roles of key players, the benefits and downside, the sponsors and goals – from accelerating Internet companies to empowerment incubators for rural and urban communities. It reviews developments in the U.S., China, Brazil, Korea and other selected situations, drawing lessons to be learned from each. The framework for assessing incubator performance is presented together with the good practices, emerging trends and some research issues.

These analyses are based on recent experience in planning, implementing and supporting the operations of incubators in some 35 countries since 1987, together with on-site interviews with public officials, university and research workers, incubator managers and their clients. The venture creation experiences in the developing countries are worthy of note – as China and India alone are expected to increase their share of the estimated global economic output to about two-fifths of the total in terms of purchasing power parity by year 2005.¹

Impact of technological innovation

A torrent of technology-based goods, services and processes hits the market every week, improving the quality of lives in some ways while also creating complexity and dislocation. The pace of progress in information and communication technologies (ICT), microelectronics, biomedical sciences, nano-technology, robotics, new materials, space and other advanced fields continues to quicken, and in turn, to change the way we live and work. The inflation-adjusted cost of computing power, for instance, has been falling by about one third per year for the last two decades while the declining cost

¹ Javed Burki, former World Bank Vice-President, Dawn, May 2001.

of communications is breaking down the natural barriers of time and space that separate markets. The number of Internet users has risen from 20 million in 1995 to 400 million in 2000, while websites have grown from 10 thousand to 20 million in the same period.² Despite this – and partly because of it – the digital divide between information-haves and have-nots is widening. The world awaits the transformation from the Information Age towards one of knowledge and wisdom.

The UNDP Human Development Report 2001, with the theme of new technologies for human development, introduces a new measure – the *Technology Achievement Index (TAI)*³. This aims to indicate ‘how well a country is creating and diffusing technology and building a human skill base’. TAI is a composite of four dimensions – the creation of technology (with indicators for patents granted and license fees received per capita), diffusion of recent innovations (Internet hosts per capita and tech-based exports as share of all exports), diffusion of old technology (log of telephones and electricity consumption per capita) and human skills (mean years of schooling and enrollment at technical tertiary levels). The listing has some surprises.

The top category of TAI *leaders* is headed by Finland, US, Sweden and Japan, together with ‘developing countries’ Korea and Singapore. The next level of *potential leaders* in technology includes Malaysia, Mexico, Argentina, Costa Rica and Chile. Among *dynamic adopters* are South Africa, Panama, Brazil, China, Egypt, Indonesia, Sri Lanka, India and others. The developing countries with active incubator programs are mainly in the third group of *dynamic adopters*. It is noteworthy that the 46 global hubs of technological innovation, led by Silicon Valley, include Taipei and Bangalore among the top.⁴ In another dimension, the World Bank’s ‘knowledge assessment scorecard’, consisting of 20 variables, gives a balanced snapshot of a country’s preparedness for the Knowledge-Based Economy⁵

But incubators are not for technopreneurs and tech-ventures alone. The majority of incubators serve mixed-clients while a new breed is focused on agri-business, kitchen products, eco-tourism, arts, and special sectoral needs. These now warrant experimentation and replication in all countries.

New role for entrepreneurship

As the large multinationals become leaner in the face of global competition, the bulk of the one billion new jobs that will be needed worldwide by year 2005 will have to come from the creation and growth of new businesses, almost all in the private sector and always starting small. While most of these will be in relatively low-tech services and manufacturing, *technological entrepreneurship* is expected to be a significant source of good jobs. The direct employment effects of such start-ups are limited, but the additional opportunities both upstream and downstream, and the ‘multiplier’ effects throughout the economy typically outnumber the direct employment by a significant factor.

According to the Global Entrepreneurship Monitor (GEM) studies by the Kauffman Center for Entrepreneurial Leadership, Babson College and London Business School⁶, the factors which affect different levels of entrepreneurship are: the perception of opportunity, the culture which respects entrepreneurs and accepts wide disparities in wealth creation, the policy and business infrastructures, investments in tertiary education, and the demographics, as men aged 25 to 34 are most likely to start a business. National social, political and economic forces and the entrepreneurial support frameworks under-pin the business dynamics wherein ventures are continuously being created and transformed.

² UNDP, *Human Development Report 2001, Making New Technologies Work for Human Development*.

³ HDR, *ibid*

⁴ 2000 *Wired Magazine*, quoted in *Human Development Report 2001, UNDP*.

⁵ *World Bank Institute and OECD, Korea & the Knowledge-Based Economy: Making the Transition, 2000*.

⁶ *Global Entrepreneurship Monitor, 1999*

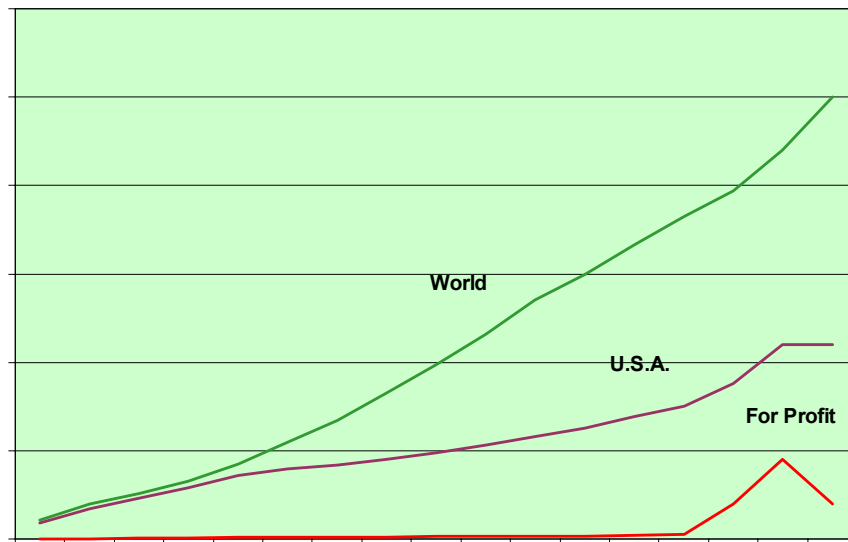
The GEM 2000 study⁷ now covers 21 countries, including India, Argentina, Brazil, South Korea and Singapore. The Total Entrepreneurial Activity Index combines two measures: the proportion of the adult population currently engaged in creating a new business, and the prevalence of new firms that have survived the start-up phase. Interestingly, at the very top of this TEA ranking of countries are Brazil and South Korea – much to the astonishment of the Brazilians and Koreans themselves!. In most developing countries, however, entrepreneurs and innovators have to struggle against severe financial, cultural and bureaucratic constraints. But when these persons migrate to a developed economy, the strong infrastructure and cultural attitudes give them a head-start, as evidenced by successful Indian and Chinese innovators in Silicon Valley, California.

In facilitating the complex transformations from the 20th century corporate style towards the New Economy culture, the entrepreneurial venture is now playing a catalytic role. The earlier model of government-operated and subsidized small enterprise support services is giving way to more market-led approaches, designed with the perspective of high levels of cost-recovery on maturity.

Characteristics of the incubation process

Business incubation has evolved in the last 30 years from experiences with the earlier industrial estates and small enterprise service centers. The ‘*first generation*’ incubators in the 1980s were essentially offering affordable space and shared facilities to carefully selected entrepreneurial groups. In the 1990s the need was recognized for supplementing the work space with counseling, skills enhancement and networking services to access professional support and seed capital, for tenants within the facility and affiliates outside. This has led to the ‘*second generation*’ incubator, although many in the developing countries are still stuck in the original mode. Starting in 1998, a new incubation model emerged in parallel. This is intended to mobilize ICT and provide a convergence of support, towards creating growth-potential, tech-based ventures.

Rapid Growth of Business Incubators



⁷ Global Entrepreneurship Monitor 2000

Of the world total number of about 3000 incubators, depending on how these are defined, roughly one-third each are in the U.S.A., the other industrial countries (in Europe, Australia Japan, Canada) and the industrializing and restructuring countries. Each group can benefit by exchanging experiences on the good (better, or best) practices as well as on the failures.

While there is some overlapping in the objectives and functions of Business Incubation Centers, Business Support Centers and other Business Development Services, each has its distinguishing characteristics and its special role in different circumstances.

Sponsors and goals

In simple terms, the traditional business incubator is a micro-environment with a small management team that provides physical work-space, shared office facilities, counseling, information, training and access to finance 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). While these can serve a variety of businesses, in the developing countries the main focus has been on technology incubators for commercializing innovations.

The predilections of the leading sponsor(s) influence the incubation goals. For instance:

| <u>Sponsor</u> | <u>Desired goals</u> |
|-----------------------------------|---|
| <i>Technical university</i> | Innovation, faculty/graduate student involvement |
| <i>Research institute</i> | Research commercialization |
| <i>Public/private partnership</i> | Investment, employment, other social goods |
| <i>State sponsorship</i> | Regional development, poverty alleviation, equity |
| <i>Private sector initiative</i> | Profit, patents, spin-offs, equity in client, image |
| <i>Venture capital-based</i> | Winning enterprises, high portfolio returns. |

Multiple sponsors bring a variety of concerns and strengths (and conflicting goals). All hope to benefit by the image of a successful program, and in turn bring credibility to the incubator clients.

Being a start-up business to serve start-ups, the incubator itself must mimic the dynamism of entrepreneurial ventures, with the prospect of becoming self-reliant within say 5 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 some from services, supplemented by subsidies (referred to euphemistically as ‘infrastructure investment’ or ‘venture socialism’).

That being said, each incubator is different from another, and the above characteristics may vary in degree of pertinence. Importantly, all incubators – traditional and tech-based – should concentrate on providing the software of value-adding counseling, training, information and networking services, as well as the hardware of affordable workspace and shared office facilities. Where the market failures are in the access to affordable work space 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!

Poor, Good, Best Practice

Many business incubators function in a weak business environment and are 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 are the well-designed facilities in a knowledge framework with committed management, that charge near-market rents and offer a variety of 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 location.

The poor performers should indeed prospect for the best practices the world over, and then adapt these, building upon what they have and know, towards good practices suited to their own culture, constraints, climate and other and conditions. Raising the majority of these incubators to the higher middle ground as they '*reconnoiter globally, reengineer-locally*', would help enhance the image of the whole incubation industry.

Incubator benefits

The benefits of a well-managed incubator can be many-fold for different stakeholders:

For tenants, it enhances the chances of success, raises credibility, helps improve skills, creates synergy among client-firms, facilitates access to mentors, information and seed capital.

For governments, the incubator helps overcome market failures, promotes regional development, generates jobs, incomes and taxes, and becomes a demonstration of the political commitment to small businesses,

For research institutes and universities the BIC helps strengthen interactions between university-research-industry, promotes research commercialization, and gives opportunities for faculty/graduate students to better utilize their capabilities,

For business: the BIC can develop opportunities for acquiring innovations, supply chain management and spin-offs, and helps them meet their social responsibilities.

For the local community: creates self-esteem and an entrepreneurial culture, together with local incomes as a 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 are the desired outcomes, 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 out-weigh the net public subsidy.⁸

It should be noted that incubators nurture entrepreneurs, who create enterprises, of which some would after leaving the incubator create direct and indirect employment, with incomes and assets, that in turn contribute to sustainable economic growth. Often the start-up entrepreneurs' task may be to create jobs for themselves and conserve their limited funds; only when they graduate and leave the incubator that some may grow exponentially creating employment, incomes and taxes.

State-business-university-professional-community support linkages

The role of the *government* is essentially to develop the technical infrastructure, policy framework and initial finance, to help catalyze the venture creation process. The *private sector* assists through mentoring, in-kind support, 'patrons club' membership subscriptions, and sub-contracts. Typically, business invests in an incubator when effectiveness is demonstrated, or as social responsibility (for instance, South African Breweries), or to acquire innovations, for intra-preneurship, or for fast profits (as in the case of the new Internet-Incubators). The *technical university* and *technological research*

⁸ Molnar et al, *Business Incubation Works*, NBIA, 1997

institute constitute the knowledge base, for the formation of technical skills and innovations. *Professional networking* and *community involvement* provide the underpinning of support.

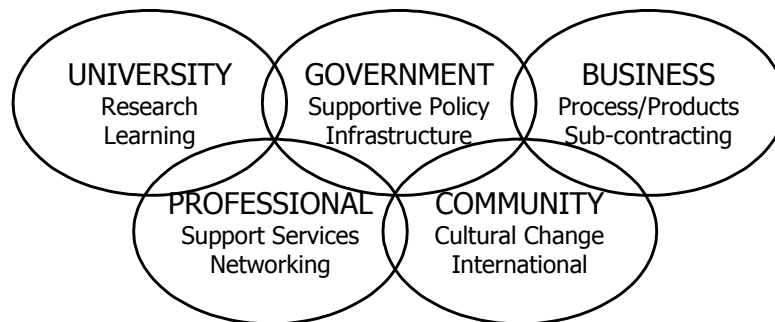
There is significant *potential for synergies* between a technology-based incubator, an affiliated technical university, both sited in proximity to a technology park, provided that this is planned from the start, all players are induced to buy-in to this potential, and the administration proactively pursues it⁹. There can be conflicts as the purpose of the incubator and park is to support rapid enterprise-creation while the culture of the university is to provide learning, within its longer cycles of the academic calendar, student graduation and faculty sabbaticals. An earlier study of the value added services by selected universities to their incubator clients had placed the use of photocopier, ‘student employees’ and ‘rent breaks’ at the top of the ranking¹⁰. Today, however, some of the most successful U.S. incubators are linked to universities.

In the Olympiad of venture creation, sources of success can be expressed as five inter-linked rings:

- Public policy* that facilitates venture creation and provides the business infrastructure
- Knowledge base* of university and research
- Private sector partnerships* for mentoring and marketing
- Professional networking*, national and global
- Community involvement* to promote entrepreneurship

The resulting configuration is depicted below:

Interactions among incubator stakeholders



In the developing country environment, the linkages in the chain are often unstructured and weak, and typically the weakest links are with the universities and private sector.

Government’s initial support to incubators makes sense under specific conditions:

- When it helps overcome market constraints, improves the access to information, finance and divisible work space not freely available,
- Extends the state’s role in providing public goods--knowledge, research, 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, teamwork, sharing,

⁹ R. Lalkaka and J. Bishop, *Technology Parks and Business Incubators: The Potential of Synergy*, IASP-AURRP World Conference on Science Parks, Beijing, 1995

¹⁰ Safraz Mian, *The University Business Incubator*, Journal of High Technology Management Research, JAI Press, 1996

- Reduces the costs and consequences of business failures, and facilitates the transition from a command to a market economy,
- When it empowers backward areas (urban and rural), youth and women entrepreneurs, and promotes employment in the longer term,
- Helps develop synergy between university, research, state and civil society,
- When support is limited to initiate the establishment, not a continual operating subsidy
- Generates taxes paid by corporations and workers, typically in excess of net subsidy, and raises incomes, sales and exports for the community and country,
- When there is client satisfaction at the services received, common costs saved and faster time to market, as well as public satisfaction at the benefits to the community.

The initiation of incubators in Uzbekistan starting 1994 is a good example of self-owned businesses, hitherto unknown, leveraging public policy towards becoming more friendly to them. This was also true in Poland and China. But in Israel public support for incubators is directed essentially to creating opportunities for émigrés and attracting foreign investment.

Down-side of incubators

Clearly, incubation has its share of problems and risks, its proponents and skeptics¹¹. 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, initial funding,
- *limited in out-reach* and makes only a marginal contribution to job-creation in the short term,
- *not yet demonstrated to provide additionality*, as most businesses start outside an incubator,
- *expensive* as it provides focused assistance and work-spaces to only a selected few,
- *duplicative* as it may undermine existing markets for business development services,
- *skills-intensive* as it requires experienced management teams,
- *creates dependency* by sheltering entrepreneurs from the harsh realities of the market,
- *calls for good business infrastructure* in a good location, and
- *requires 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, by careful planning of the incubator, consensus building, patient support and strong leadership.

Enter the Internet Incubator

In the 1999 – 2000 period, some 400 for-profit, Internet incubators were added in the U.S and elsewhere, due to the expanding opportunities that the Internet seemed to offer and due in part to unrealistic expectations. Typically, this model provides a smart workspace, 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 bulk of these incubators -- once considered the paradigm of best practice -- have closed down. Nevertheless, the equity-based, net-worked model has taught some lessons and continues to have relevance¹².

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 behavior of stock markets.

¹¹ See, for instance, *Crossfire in Small Enterprise Development*, IT Publications, London, June 2001

¹² M.T. Hansen, N. Nohria, J.A. Berger, (2000), *Harvard Business Review*

The Internet is growing rapidly in to the developing world, with some 1.2 million hosts in Brazil and 863 thousand in Korea hosts¹³. ICT incubators are now being planned in many of these nations, such as in Brazil, Korea, India, and Dubai.¹⁴ 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 millennium to the sustainable incubator model, the primary requirements are: develop a smart work-space with strong e-infrasrtructure, enhance the quality of management, marketing and networking support for client-companies, actively promote the innovation process, facilitate access to capital sources geared to risk, and a steady flow of deals to match market needs. The legal persona adopted should provide for autonomy and prompt decision-making. The tech-accelerator can benefit by linkage to a knowledge-base and technology park, as in the case of the new Panama Technology Business Accelerator¹⁵.

Incubators for empowerment

Internet-enabled “cyber incubators” are emerging to provide counseling and training support to larger numbers of small businesses over long distances from multiple sources. These can be especially useful in serving remote locations, such as in the campaigns to spread economic development to western China, address needs of workers being retrenched from state-owned enterprises, and serve many more ventures at lower cost per beneficiary.

Business service and incubation centers for assisting rural communities are needed in developing countries, where typically two-thirds of the population is agriculture-based. Establishing an incubator in this environment poses special problems, as the local infrastructure is usually weak, often neglected. In turn, the skills and communication bases are poor and so is the access to finance for the facility and for its beneficiaries. The business improvement services have to be geared to these local conditions, and the political/organizational boundaries properly bridged. Where the population served is very small, scale-economies may be promoted by networking with other support agencies¹⁶.

Recent examples of incubation focused on small-town and rural environments are the agri-based Ruhuna Business Incubator at Matara in Sri Lanka and the tourism-based Luxor Incubator, Egypt¹⁷. In Nepal, Lotus Holdings provides design, export-marketing and other *in situ* support to entrepreneurs producing carpets, handmade paper and pashmina products¹⁸.

Developing sustainable livelihoods towards alleviating poverty requires improving access to a variety of hitherto unavailable assets – human, physical, financial and social capital together with cultural and natural resources. Exhortations regarding the ‘participation’ by the local community in design and implementation imply that the program is externally imposed on their lives. In most poor communities, however, working is a part of living itself, not a separate wage-earning activity, and the development process also has to become an intrinsic part of living. It must address the pre-requisites of food security, health care, primary education and employment as well as the concerns for equity, gender balance, environmental preservation, and traditional knowledge. The three-millennium-old wisdom is relevant for planners today: “*Go to the people. Learn from them. Start with what they know. Build with what they have. And with the best leaders, when the work is done, the task accomplished, the people will say, ‘We have done this Ourselves’*” (Lao Tsu, China, 700 BC).

¹³ UNDP HDR *ibid*

¹⁴ *Proceedings of 14th NBIA conference, San Jose, CA*

¹⁵ R. Lalkaka, *PTBA-Business Plan Study, Inter-American Development Bank, Washington DC, 2001*

¹⁶ . Adkins & H. Sherman, *Rural Incubators – What makes for success, NBIA Conference, May 2001*

¹⁷ *BTDS Feasibility analyses and business plans , UNIDO, April 2000 and October 2001*

¹⁸ *Lotus Holdings Newsletter, June 2001*

The worlds largest program: USA

Business incubators in the U.S. have grown rapidly in numbers, from less than 100 in 1980, to about 1,000 in year-2000 – the largest in the world. In many ways the U.S. has been a pioneer in the industry, starting with the seeds of the concept in Thomas Edisons’ ‘inventions factory’ and Frederick Terman’s mentoring of students like Hewlett and Packard. Many practices at developing country incubators have been derived from the American experience.

Main features

Results of the 1998 NBIA survey of members are shown below¹⁹.

- 87 percent of firms graduated are still in business, mainly in their local communities.
- Publicly supported incubators create jobs at a cost of about \$1,100 each, whereas other public mechanisms often cost more.
- Every 50 jobs created by an incubator client generate another 25 in the community. .
- Incubator tenants employ an average of 85 people; each job in incubator creates 0.5 indirect job
- Incubator clients and graduates have created approximately half a million jobs since 1980.
- Conventional incubators have an average full-time staff of 2.8 persons.
- 22 percent of incubators took equity and/or royalties (in 1988, much higher now)
- 75 percent of incubators are nonprofit and 25 percent are for-profit.

Incubator sponsors

US incubation programs usually start as local initiatives by economic development agencies. Following the initial preparations, federal agencies are approached such as the US Department of Commerce and Economic Development Administration, Departments of Housing/Urban Development, Health/Human Services, Agriculture, and regional development authorities. Federal funding is usually limited to preparation and construction costs and research grants for client companies. Thus, most of the managements have to spend considerable time and effort in raising supplementary operational financing.

The pattern of US incubator sponsorship is as follows (*Source, NBIA, 2000*)

| Sponsor | Percent (%) |
|-----------------------------------|--------------------|
| State/local/provincial government | 24 |
| No sponsor (independent) | 18 |
| Economic development group | 18 |
| Educational institution | 20 |
| Venture capital | 8 |
| Other | 12 |

In terms of location, the bulk are urban (45%), then rural (36%) and suburban (15%).

The main focus areas are: 43% Mixed use, 34% Technology and Targeted, 10% Manufacturing, 6% Services and 7% Empowerment and others. Average annual operating costs are about US\$ 350,000 at a technology incubator, and roughly half that amount at service or mixed use facility.

A NBIA manager compensation survey (2000) indicated a significant increase in median salaries of U.S. incubator managers -- from US\$ 34,500 in 1992 to \$ 63,500 in 2000. Salaries were as high as \$107,000 at Internet based incubators, and the majority received bonuses, stock options or royalties. But those days are going, going, gone.

¹⁹ *Source: 1998 Business Incubation Industry, NBIA*

Pattern of practices at tech-incubators

At U.S. technology incubators, the service most in demand is access to external experts.

Technologies services at US incubators (Valid percent responses)

| | Yes, direct | Yes, referral | Both | Rarely |
|--|--------------------|----------------------|-------------|---------------|
| Consulting faculty, students | 51.9 | 30.8 | 13.5 | 3.8 |
| Organize access to external facilities | 62.7 | 15.7 | 17.6 | 3.9 |
| Locate key technical staff | 27.5 | 45.1 | 21.6 | 5.9 |
| Use data bases if researchers | 46.0 | 34.0 | 12.0 | 8.0 |
| Finance research and development | 27.8 | 45.1 | 3.9 | 23.5 |

Source: Tornatzky, et al (1996)

Case example of operations at university related tech-incubators

Many U.S. technology incubators are associated with universities and/or science parks. Due to the success of the Stanford Research Park starting in 1951 and the Research Triangle Park in North Carolina in 1959, state and local economic development programs have sought to create public-private partnerships to replicate these hubs of technological innovation. Many regions and countries have tried to develop a **Silicon Valley** variant but without much success as these lack the unique congruence of university affiliations, risk-taking and innovation culture, business infrastructure and ethnic mix, and critical mass of venture capital, legal, accounting and management services.

The Advanced Technology Development Center (**ATDC**) at the Georgia Institute of Technology, Atlanta, the Ben Craig Center (**BCC**) at University of North Carolina, Charlotte, and the Rensselaer Polytechnic Institute (**RPI** Incubator), New York, are among the best of the 50 or so US university-related incubators. Other notable examples are the Boulder Technology Incubator and Austin Technology Incubator, Texas²⁰. The University City Science Center in Philadelphia has links to two dozen educational institutions in the area.

ATDC started in a renovated high school in 1980 and moved to a new building in 1984. It operates the Entrepreneurial Services Program for moving technologies to the market, as well as faculty and corporate research programs. 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 4-step Due Diligence Program of interviews and reviews to select growth-potential applicants. ATDC also runs a useful 'brown bag program' of weekly lunch time speakers.

The average jobs come to 5 per member companies and 65 in graduates, average revenues \$0.3 mill at members and \$ 8.7 million in graduates. Through a state expenditure of \$ 20 million since 1981, some 2,100 jobs have been created together with other promotion functions for Georgia state. The benefits for companies are essentially the increased creditability and access to facilities through proximity to a renowned institute, less so the space and services provided by ATDC.

BCC, Charlotte is a non-profit corporation supported by the public University of North Carolina Foundation. The incubator is in a well-designed, \$ 3.5 million building (5,000 sq m space). It has 24 tenants and 6 graduates. The bulk of the tenants are in technology services (41%), and software (24 %), the rest in instruments, chemicals, and electronics. BCC also has an affiliates program 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, library and lab services.

²⁰ Sources: Culp and Shapira, 1997; Sarfraz Mian, 1996, Mark Schaffner, 1999, Wolfe, Adkins and Sherman, *Best Practices in Action*, NBIA, 2001

So were the typical incubator services such as accounting, marketing and business plan preparation. BCC promotes its activities with a campus in Germany.

RPI, a private engineering institution with a focus on technology commercialization, has operated a incubator with 125,000 sq ft space on its campus in upper New York state. It is noteworthy for the strong continuing links between faculty, facilities, students and graduates with the incubation activity. The university's technology licensing office is in the incubator while its placement office actively places students in the incubator as interns. Over the last 20 years, university-based projects have constituted over two-thirds of the 140 clients. Presently the incubator has 28 clients with revenues of \$ 14 million. An illustrious graduate is MapInfo, a leader in desktop mapping software, with sales of \$ 100 million annually.

Further, Rensselaer manages a 1,250 acre Technology Park, with some 50 companies employing 2,300 people. It also has programs of 'venture affiliates' who meet for networking, and a Capital Regional Technology Development Council of business leaders to mentor local entrepreneurs.

Both ATDC and BCC continue to operate on significant subsidies, while Rensselaer operates independently (with only the vacant building contributed by the university).

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

Corporate incubators

While the upsurge in dot-coms is now history, the for-profit corporate incubators continue.

The corporate incubation model

| Corporation Name | Incubator Name | Year Started | Location | # of Clients | # of Grads | # of Emp. |
|-------------------------|--|---------------------|-------------------------------|---------------------|-------------------|------------------|
| Panasonic | Panasonic Internet Incubator | 1999 | San Francisco & Cupertino, CA | 10 | 8 | 1.5 |
| Coca-Cola | Fizzion | 2001 | Atlanta, GA | 0 | 0 | 8 |
| Intelligent Systems | Intelligent Systems Incubator | 1990 | Norcross, GA | 15 | 32 | 4 |
| Reuters | Reuters Business Incubator | 2000 | London, New York, Hong Kong | 8 | 6 | 5 |
| Monsanto | Nidus Center for Scientific Enterprise | 1999 | St. Louis, MO | 5 | 0 | 5 |
| H. B. Fuller | EntreGrow | 2001 | St. Paul, MN | 0 | 0 | 5 |
| Lucent | New Ventures Group | 1997 | Murray Hill, NJ | 30 | 30 | 35 |

Source: The Corporate Incubator, Carol James, NBIA Review, August 2001

Typically, this model provides the considerable reputation and resources of the sponsoring corporation towards meeting its unique goal through supporting selected ventures. The Panasonic incubator at Cupertino, CA, seeks to create strategic partnerships for attracting innovations while the Reuters incubators promote innovations by its own employees. Monsanto's Nidus Center has broader economic development goals of stimulating entrepreneurship in the region. Intelligent Systems has used its incubation facility to invest in early-stage tech ventures.

The success of the US incubator industry is attributed by Professor Nathan Rosenberg to 'government policies that reduced barriers to entry of new firms into the high tech sector, the crucial role played by the private sector economy, a large and extremely responsive university system, and to a major institutional innovation – the venture capital industry.'²¹ To these factors may be added the inherent spirit of risk-taking, the ethnic mix, and the positive educational role played by the National Business Incubator Association.

Rapid incubator expansion in China

From its beginnings in 1987 with a catalytic UNDP input, the China incubation program has developed into the largest of its type in the developing world. Based on our research, there are now some 127 incubators in China, located in every province, autonomous region and major city except Tibet and Qinghai²². In addition there are many other organizations such as "software parks" that function much like incubators, for a total of around 200 as of 2000. The program expansion has been the result of significant subsidies -- usually up-front in land and buildings, low-cost or no-cost loans by local state agencies, and some on-going operating subsidies.

Sponsors and characteristics

For the first decade of their existence, incubators were initiated, funded and managed by the government based on its strategic priorities. Technology commercialization has been the objective of almost all incubators to date. As of year-end 1998, 111 of 127 (87%) incubators in China, had a general technology orientation, while some focused on sectors such as biotechnology, pharmaceuticals, materials science and oceanography. According to the government's Torch program regulations, priority technologies for China are: new materials, environmental technologies, electro-mechanical technologies, biotechnology, aerospace and information technologies.

Chinese incubators are typically very large by international standards, with an average size in excess of 10,000 sq. m. and providing shared physical facilities such as conference and exhibition rooms. There are no credible evaluations of incubator effectiveness in China. Our recent assessment as a "desk study" did not permit extensive field interviews, but surveys of limited samples of sponsors and tenants at Tianjin, Tsinghua and Hefei indicated overall satisfaction at the performance of these facilities²³. Almost all provide "one stop" facilitation of business registration procedures and preferential government policies. Overall, they tend to give priority to physical facilities at the expense of business services.

The incubators are generally non-profit, state-owned entities, sponsored by local affiliates of the Ministry of Science & Technology, and more recently, the Ministry of Education. A small number of for-profit corporations have recently made an appearance. While detailed statistics for *all* Chinese incubators are not available, we do have good data for 77 incubators tracked by the Torch Program. In 1998, these incubators had an average floor space of 11,475 sq m, 54 tenants and 896 employees. Each had an average of 17 graduate companies, that employed 612 persons (at graduation).

The Torch Program Office of MoST is responsible for organizing and guiding China's official technology incubator program. Provincial, county, municipal and district Science and Technology Commissions implement the program in their local jurisdiction, provide land for buildings, low (or no cost) funds, and a variety of tax benefits. In addition, national-level High Technology Development

²¹ N. Rosenberg, Stanford University, 'The physiology of successful business incubation', *International Conference, Pudong, China, April 2000*.

²² R. Lalkaka, Ma Feng-Ling and D. Lalkaka, *Assessment of China Incubator Program, UNIDO, 1999*.

²³ *Survey supervised by Ma Feng-Ling and D. Lalkaka, March 2000*.

Zones also promote TBIs. The exclusive state sponsorship is now giving way to incubators sponsored by private corporations.

Universities have strong linkages to the incubators. Tenant companies are mostly spin-offs from universities, research institutes and state-owned enterprises. Ownership of the spin-offs typically remains with the parent institutions, which also provide the finance. However, in recent years there has been a steady increase in the number of privately-owned tenant firms, drawn from various sectors of society including scientists leaving the state research institutions; they must raise financing from their own sources.

Hitherto sponsors have not played an active role in the governance of incubators, but this is changing. The public-private partnerships at the new Nanjing and Chengdu incubators have established Boards that participate actively in supervising operations. The Tianjin incubator for laid-off women workers has established an advisory board which includes representatives from a variety of organizations. The structures vary, but they are typically headed by a Director, and include an Enterprise Department responsible for services to tenant enterprises, Real Estate Management Department responsible for routine management of building services, Finance Department responsible for bookkeeping and financial services for the incubator and tenants, and a General Office responsible for secretarial services.

International Business Incubator

An incubation variant pioneered in China is the *International Business Incubator*. Starting in 1996, the Chinese IBI program was designed by Business & Technology Development Strategies, New York, and the TORCH team. Eight existing technology incubators have been transformed into IBIs, namely, Beijing-Fengtai and Tianjin (in north China), Shanghai, Suzhou, Wuhan and Xi'an (east and center), Chengdu and Chongqing (south-west). The IBIs offer competent support and modern facilities to international technology-based companies and Chinese scholars now overseas. Further, the IBIs provide support to local companies in their efforts to export their products, services and technology as well as to enhance their competitiveness abroad.

They now have their own network. The authorities recognize that more work is needed to train the managements and to promote the IBIs abroad, for attracting foreign and overseas Chinese enterprises, their technology and investment into local markets.

Similar initiatives are at the International Business Incubator, San Jose, California and Ben Craig Center at University of North Carolina, Charlotte, and others are on the way.

While the *spontaneous clustering* of like-minded producers of traditional goods and services has been around for centuries in many developing countries, what is new is the usefulness of such cooperation-competition in the advanced technologies. Good examples are the Zhongguancun Science Park in Beijing, linked to Peking and Tsinghua Universities, and the agglomeration of informatics-related activities along the highway from Shanghai to Suzhou.

Other cluster developments to be watched in future are the Multimedia Super Corridor around Kuala Lumpur, the agglomeration of biotechnology firms in Belo Horizonte and Rio in Brazil, and the ICT concentrations around Hyderabad, Pune and Bangalore in India.

Strengths of the China program

The **strengths** are outlined below:

1. Strong state leadership in an era when market forces were still nascent has been the main determinant of the growth of China's program to about 200 incubators today
2. There is a continuing demand on low-cost space even with few services provided but with significant benefits from the state by being resident in an incubator.
3. Importantly, 'anchor tenants' (such as banks, super-markets, restaurants) occupy prime spaces in the incubator and help raise revenues.
4. Significant numbers of enterprises, sales and jobs have been created, technologies commercialized and taxes generated. .
5. The program has pioneered in such fields as the International Business Incubator and the incubator taking equity in tenant-companies.
6. Chinese incubators have been a means of creating cultural change.
7. CASTIP, the incubator association, has been promoting learning opportunities. A measure being explored is 'twinning' with foreign incubators (called 'dumbbells' in the Chinese idiom)

The program 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'

The weaknesses of the program, well recognized by the Chinese authorities, include:

1. *The program has made little effort to create "ownership" by the communities in which incubators are located.* Governance continues to be a weak link.
2. *It has had a near-exclusive concentration on technology enterprises.* The potential to address other social and economic issues has not been fully explored, such as empowerment incubators for western China, for women, minorities, and retrenched workers from state enterprises.
3. *The program is heavily focused on the "hardware" aspects of incubation.* Physical space and facilities have had priority, to the neglect of the "software" of quality business support services.
4. *Incubator managements have little entrepreneurial experience.* This further limits the quality of the "soft" business support services they can provide to their tenants.
5. *The services that are provided in-house are typically not on a cost-recovery basis.* This limits their quality and sustainability. This of course is true in many developing countries where entrepreneurs have no personal savings and expect that all support from a government sponsored program must come free of charge.
6. *Monitoring and evaluation of the program is inadequate*

Overall, the program has been effective in the results obtained and in meeting national objectives. Qualitatively, incubators in China — as elsewhere — have much to do in order to rigorously evaluate and benchmark their operations, towards enhanced performance.

Features of the Brazil program

Brazil now has about 160 business incubators, starting with ten a decade ago. It was announced at the World Business Incubator Conference, October 2001, that based on a national competition, 40 additional locations were selected for support.

General features

Their objectives are essentially to help commercialize technology, diversify regional economies, foster entrepreneurship and generate employment. The cultures of risk-taking, cooperation-to-compete, and technological innovation are now emerging, together with venture capital and better recognition of intellectual property issues. Over 1,200 enterprises are located in the incubators and employ 5,000 persons, of whom almost 30 percent are women. The incubators are reported to have graduated 350 companies. Some 70 percent are linked to universities and are located mainly in the industrialized South and South-east of the country.

The tenants are in computing software (33 %), services (17 %), electronics (14 %), biotechnology and chemistry (9%), mechanics (8%), food products (5%), and other categories. Interestingly, the focus has shifted in the last three years, with lower proportions devoted to the technology sector and a rise in the mixed and traditional businesses.

It is noteworthy that the Industrial Federation of Sao Paulo State (FIESP) has sponsored and managed 14 incubators, which have nurtured 166 companies and created 826 jobs in traditional industrial ventures.²⁴ FIESP plans another 10 incubators by end-2001. In most developing countries, the private sector is hesitant to develop its own incubators, preferring to mentor the client companies through the managing board without a financial stake.

The incubation industry is well supported by the Service for Support to Micro and Small Business (SEBRAE). The Brazilian Association of Business Incubators and Science Parks (ANPROTEC), founded in 1987, is among the strongest incubator/park associations the world over. Among the largest sponsors of incubators are federal-state agencies (52 %) and private not-for-profit/for-profit organizations (40 % of total).

The *Inovar Project*, a consortium led by FINEP, is establishing a comprehensive institutional structure to promote the culture and capacity for venture capital operations. It expects to leverage \$ 200 million for new tech-based ventures; a Website for information, analysis and virtual match-making; capacity-building programs for VC professionals; a Venture Forum and business network to support growth-potential entrepreneurs.

In 1997 *Projeto Inventiva* was sponsored by the Secretariat for Industrial Technology of MICT, FIESP, SEBRAE and the Patent Office - INPI, to recommend policies and incentives to stimulate the innovation process. Among its recommendations was setting up a network of 'innovator desks' to provide information and assistance to local innovators²⁵.

Good practices emerging from incubator experience in Brazil

A recent study applied a quick-assessment method to the ParqTec incubator in Sao Carlos, SP, and the Biominas incubator in Belo Horizonte, MG,²⁶ This indicated that they have had **positive impacts and outcomes** on their respective city and state economies by nurturing entrepreneurs and creating sound enterprises with good survival rates. According to this study, ParqTec has generated employment with public subsidy of around US\$ 3,258 per job, without including jobs in affiliates. The estimated return in the form of taxes could be about \$ 6 per dollar of subsidy.

That being said, Biominas and ParqTec have the major challenges ahead of enhancing their operational effectiveness through innovative activities and creative financing, increased occupancy

²⁴ Communication from Ms Conceicao Vedello, economic researcher, June 25 2001.

²⁵ Lalkaka R and D, *Technological Entrepreneurship Development, Projet Inventiva, Brazil, 1997*

²⁶ Lalkaka R, and Shaffer D., *Technology Business Incubation in Brazil, UNDP, March 1999*

and higher fees for quality services, with more affiliate companies and anchor tenants, in order to reduce the present dependence on state subsidies.

Some lessons to be drawn from Biominas and ParqTec assessments are outlined below. These are similar in many respects to the China situation:

1. **Identifying strong sponsors and a clear mission:** Both incubators have pro-active promoters and wide-ranging support from the state as well as university, banking and civil society. This buy-in by the respective communities is a key success factor. Federal agencies such as SEBRAE, FINEP, CNPq and local state and city governments have given strong continuing encouragement and funding. In turn, the incubator acts to promote the state to attract foreign investment.
2. **Finding a committed champion.** Personalities, business and political, can play seminal roles, as amply demonstrated in MG and SP. By pulling the right strings and pushing open the right doors, the ‘champions’ are able to help overcome barriers and leverage support. Biominas is a fine example of strong private biotech business involvement.
3. **Selecting good locations and planning functional buildings:** The Belo and Sao Carlos locations provide the business infrastructure in proximity to knowledge centers. Buildings are of good design and quality to attract tenants.
4. **Building a dedicated, trained management team:** The Brazilian managers have been well trained, properly remunerated, and enabled to participate regularly in international seminars.
5. **Selecting good entrepreneurial tenants:** Persons with innovative concepts, analytical and interpersonal skills, and strong growth potential are not easy to find, as Biominas now knows. Good practice calls for a transparent process for their selection, a flexible means for graduation, and pre- and post-incubation support..
6. **Mobilizing investment and working capital for incubator and its tenants:** Brazil has a variety of financing sources for incubator and tenants. At the same time, incubator boards must move progressively towards better recovery of operating expenses, say three-quarters on average (up to 100 % and more at for-profit incubators).
7. **Developing creative ways of raising revenues.** For instance, the Biominas Foundation organizes the procurement of imported equipment and supplies for its tenants and affiliates, who pay a small fee but the Foundation is exempt from customs duties. Both incubators are establishing adjacent technology parks to further enhance incomes and influence.
8. **Adding value through quality services for tenant companies and affiliates:** The rationale of incubation is not just bricks-and-mortar but the counseling, training, information dissemination, synergy. Typically, the services offered in Brazil are inadequate
9. **Developing relationships to technical universities and research institutes.** In Brazil as in other industrializing countries, many of the incubators are linked to technical universities as the main sources of technology for commercialization, faculty expertise, graduate students, documentation and laboratory support. These relationships need to be structured, with formal agreements between university, faculty and client companies for co-venturing.
10. **Promoting the participation of women.** Biominas and ParqTec have a number of women beneficiaries. At the time of the study both had a women-owned enterprises and also women in leadership positions in the incubator managements.
11. **Monitoring performance and assessing impact:** A SEBRAE representative sits on the governing board at both incubators to monitor the use of state funds. Sponsors have themselves to blame if

they do not participate, self-critically, in over-seeing the progress of their interventions or do not insist upon a modern MIS system for collection of complete data.

12. **Strengthening industry associations and international relationships:** ANPROTEC is playing an important role in compiling statistics, organizing regional and international conferences, and linking up to the international community. It now plans a benchmarking program.

The changing pattern of work, exponential technological change and globalization of trade now require that incubators -- and the businesses they serve -- plan purposefully for the future, if they are to survive and prosper. At both Brazilian incubators the managements are developing their own venture capital funds and affiliated technology parks. The Brazil incubator program now needs to move in three directions: One, developing mixed business incubators to meet the special needs of rural communities, based on local markets, resources and skills; Two, reducing dependence on public funding for its operations, and Three, initiating a rigorous monitoring and benchmarking program to enhance performance.

Japan: a late starter, now moving fast

For decades the Japanese economy was seen as a dual structure comprising modern large corporations and backward small businesses . In 1971 the term ‘venture business’ emerged, that is, the entrepreneurial research-based firm²⁷. In 1999 the ‘Law for Facilitating the Creation of New Business’ was enacted and the Japan Council of New Business Support Organizations was formed (which in English is referred to as JANBO – Japan Association of New Business Incubation Organizations). This government-sponsored organization has the mandate to link the ‘core support institutions’ and others through seminars, information, training courses, and international exchanges.

203 business incubators of different types are reported to be in operation, of which about one-third provide typical incubation services with dedicated management staff. Some of the others lack the distinguishing features of incubation. The Vision for year 2010 calls for developing 300 new incubators and training 500 professional managers, to create 150,000 new jobs.

Conditions today are more favorable to new venture creation and business incubation; however, the culture of questioning authority and spirit of risk-taking which form the foundations of an entrepreneurial society, of research productivity and technological innovation, are still in nascent stages. Another major constraint is the lack of experienced incubator staff, and programs are underway for specific training and accreditation of managers.

An example of the new spirit of entrepreneurship is Neoteny, a year-old, self-financed incubator, with a staff of 40 persons servicing 11 companies. While Softbank, the Internet investment empire, has fallen others such as Netyear, the Interney-cum-consultancy accelerator, are doing well.

Developments in selected industrializing countries

Incubators in developing and restructuring country are essentially based on USA practice²⁸ due in part to their participation in NBIA conferences and access to publications; however, the conditions of weak business infrastructure, repressed entrepreneurial energy, scarce financial resources, poor university-business linkages and inadequate state support mean that the US practices must be adapted

²⁷ Term originating in the book ‘Venture Business: Small Giant Firms Selling Brains’ by Professors Hideichiro Nakamura, Tadao Kiyonari and Koji Hirao, quoted in *The Entrepreneurial Revolution and STIPs in Japan* by Prof. Hideto Obtsuko, 2001

²⁸ Wolfe, Adkins, and Sherman, *Best Practices in Action: Guidelines for Implementing First-class Business Incubation Programs*, NBIA, June 2000

(not transferred) to local culture, resource constraints, and special conditions (colonial legacies, climate, etc). The cliché that no two incubators are alike is specially so in the developing countries. Or to paraphrase Tolstoy, happy incubators have a commonality of practices; unhappy ones are unhappy in their own unique ways.

Status in selected countries is summarized below.

India

India's 18 *Software Technology Parks (STPs)* and 15 *Science & Technology Entrepreneurs Parks (STEPs)* are similar in some respects to technology incubators while lacking a few of the distinguishing features. In addition, full-fledged incubators are now being established at the Indian Institute of Technology in New Delhi in Mumbai, a university in the south for biotechnology, an Advanced Materials Technology Incubator in Hyderabad, and other locations.

Among developing countries, India had an early start on building small business support, entrepreneurship and scientific research capabilities. For instance, the *Entrepreneurship Development Institute - India*, Ahmedabad is world-class and the network of laboratories of the Council for Scientific and Industrial Research with 10,000 researchers, is among the world's largest. With economic liberalization since 1991, India is pursuing the IT industry as a major thrust area, for export and domestic markets.

Today some one-third of the Fortune-500 companies out-source their software requirements from India. India's software industry employs 200,000 people and produced over US\$ 10 billion in 2000, a 10-fold increase in less than a decade. Exports have reached \$ 6 billion, about 15 % of total exports, mostly to the U.S. and mainly as end-user application products and services. Despite the down-turn in the global economy, exports are expected to rise higher, IT-enabled services to reach \$ 17 billion, and employing a million persons by 2008²⁹. Main current constraints are skilled personnel and finance. Several US venture capital companies are investing in Indian software and Internet companies.

A significant initiative of the Department of Electronics is the *STPs*, to help strengthen the 'India - Software Advantage' that includes:

- Large, English-speaking personnel pool, with technical & management skills;
- State-of -the-art technologies and equipment, significantly lower development costs;
- Quality assurance levels, ISO 9000 certification and copyright protection;
- High speed datacom links and time advantage, for 24-hour development.

STP-I is an autonomous society for promoting software centers -- private or public or wholly foreign owned. Through "single-point contact" for all regulatory functions, the sponsor can get duty-free imports of equipment, custom-bonded warehouses for materials, income-tax exemptions for five years, repatriation of know-how fees and royalties, in order to develop and export software (domestic sale upto 50 % of software exported). Global connectivity is being provided through International Gateways, microwave links and the Software Exporters Network (SoftNET)

STP-India has set up Parks at Bangalore, Pune, Bhubaneswar, Hyderabad, Jaipur, Chennai, Noida/Delhi, NaviMumbai, Chandigarh, Gandhinagar, Calcutta and Trivandrum, while some state governments have their own schemes. STPI also has an outpost in San Jose, CA to help small software companies. In addition, Export Processing Zones are established at seven port cities, essentially for software exports. At these places, reliable high speed data communication

²⁹ NASSCOM estimate, 2001

infrastructure has been created for executing off-shore projects, remote computing, software development and maintenance.

Bangalore's claim to be the "Silicon Valley of India" is being challenged by the techpark -cum-information university — *Information Technology City*, Hyderabad in central India. The project outlay is estimated at US\$ 428 million on a 64 acre site that will host India's fastest growing sectors - software, hardware, engineering and financial services. India is moving beyond the traditional body-shopping towards higher-level demands. Also at Hyderabad, a Government of India supported incubator has been established focused on advanced materials technologies.

The STEPs are located at 12 technical universities, sponsored by the Department of Science & Technology and financed by leading financial institutions. The STEPs are being refurbished to become more helpful to graduate students and others seeking self-employment. India's STPIs and STEPs are similar in many respects to TBIs while lacking some distinguishing features. Being a late comer to the incubation business, India has the possibility of moving rapidly based on experiences elsewhere.

Republic of Korea:

Korean economy has grown rapidly, with per capita income rising at average 6.8% annually between 1966 and 1996, when it became an OECD member. The financial crisis in 1997 and IMF 'bail-out' have had profound impacts on the pattern of business and the pace of new venture creation³⁰. Given the specter of global recession, the World Bank-OECD study calls for urgent action on increasing productivity, becoming more internationalized including opening up to more foreign investment and trade, and a moving away from the past government interventionist policies and over-regulation.³¹

With decline of the old conglomerates and distrust of financial institutions, investors have moved into entrepreneurial start-ups, now called the '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. These venture firms have grown four-fold in numbers in the last two years, to some 10,000 (December 2000). As noted, the GEM 2000 study found that 9 % of Korean workers were employed by firms less than three and half years old, compared to half-percent in Singapore and Japan. It is also interesting that over the few years the proportion of new ventures founded by public sector research institutes and universities has increased.

Although the first Korean incubator was started in 1993, the major expansion has taken place in the last three years. There are about 200 total, with 144 incubators in actual operation today, with plans for many more. Most are under the Small and Medium Business Administration, Ministry of Commerce, Industry and Energy, and Ministry of Information and Communication. The majority (about 85 %) are affiliated to universities. Half the client businesses are in Internet and software-related work, about 14 % in equipment and instruments, 11 % in biotechnology³². Presently there are about 3,000 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 sq.m., each with about 15 tenants³³.

³⁰ *The Economist*, January 13, 2001

³¹ *Korea and the Knowledge Based Economy*, *ibid.*

³² *The Present condition of KOBIA*, NBIA Conference, San Jose, April 2001

³³ Kap Seung Yang, *Current Situation of Business Incubation in Korea*, NBIA 14th Conference, San Jose, CA, May 2001

A technology incubator focused on enhanced business services is sponsored by the Ministry of Science and Technology at the Korean Advanced Institute of Science & Technology in Taedok Science Town³⁴. Its strategic vision includes a Competitive Technology Assessment Center to evaluate the potential of the innovation in the market. An earlier 1997 workshop in Taedok on ‘Creating a Silicon Valley in Korea’ had concluded that it was easier for Korean entrepreneurs to move to the Valley than to transfer that culture to Korea; today both moves are taking place and Taedok Science Town is taking on the attributes of a Taedok Technology Valley.

But the dotcom debacle has taken its toll: two years ago there were 100 for-profit incubators in Korea, only 10 remain today. Among the survivors is InternetCircles Co in Seoul, which provides focused support to a limited number of Internet-related clients plus extensive business consulting services to firms inside and out³⁵. A new development is the involvement in incubators by some *chaebol* groups, such as Samsung electronics, LG, and Korea Telecom. Their purposes are to create new business opportunities through linkages between complementary assets within the group, and to promote their organizational restructuring.³⁶ VC and tech-based medium sized firms are also becoming involved.

The main problems encountered by incubators in Korea are

- scarcity of trained managers and poorly developed operating systems,
- inadequate support services for tenants,
- poor specialization based on regional characteristics, and need to move beyond the Internet
- heavy reliance on state subsidies, and inadequacy of finance for tenants despite good VC firms
- need for improved networking to universities, research institutes and technology parks,
- better promotion of the incubation modality through success stories.

A major drive is underway on the ‘professionalization of incubator staff’. The new Korea Business Incubation Association is addressing these issues.

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 first consultant study to entry of first batch of tenants took 9 months – a relatively short duration given the adverse conditions of an economy just beginning the transition to a market system³⁷. The program is reported to have served about 245 companies, created 2,800 jobs, and trained 12,000 persons³⁸.

In 1996 the Republic Business Incubator Network was initiated, and has been expanded to about 20 facilities; of these about half are functioning as proper incubators, mostly in agri-businesses. The program’s main purposes are to promote technology commercialization, develop a supportive legal environment and business infrastructure for start-ups, and train entrepreneurs in the skills needed by a market economy. A National Coordinating Committee including state, university and non-governmental organizations guides the program while the Incubator Association provides technical, training and information support.

³⁴ Zong-Tae Bae, *Activating Science and Technology Parks and Business Incubators in the Republic of Korea*, APEC Conference, China, June 2001.

³⁵ Sewon Hong, *Business Incubation in Korea and Internet Circles*, NBIA 14th Conference, May 2001.

³⁶ Lee Kak Bum, *The evolutionary process of venture incubation in Korea*, IJEIM special issue, 2002

³⁷ R. Lalkaka, *Feasibility Analyses in Uzbekistan*, UNDP/UNIDO, 1994 – 97.

³⁸ J. Bischoff, *Overview of Successful International technology Business Incubator programmes*, International Workshop on Technology Business Incubators, Bangalore, January 2001.

Uzbekistan provides a good example of strong state support and effective donor intervention. The program is being used effectively to leverage small-enterprise friendly policies.

South Africa

RSA has had for many years 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, there is the severe problem of unemployment, with over half-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 has initiated the Project Noah. Its mission is to pro-actively assist in developing business and vocational skills and support out-placement. As part of the Project Noah, a business incubator has been started at Isando near Johannesburg airport. The low skills-level of the retrenched is a major constraint to new business creation.

Incubator developments are also underway in Kimberley, Bloemfontein, Welcom, Natal and the Council for Scientific and Industrial Research as well as a UK government assisted program.

Malaysia

The Industrial Master Plan (1996-2005), in the context of government’s Vision 2020, recognizes the imperative of a competitive small enterprise sector. This calls for developing a strong technical infrastructure, supportive state policies, massive investments and tax incentives for research and human resource development, new structures for university-business linkages, a range of financing instruments for innovation, and continuing support to technology incubators³⁹.

Starting in the early 1990s, Technology Park Malaysia is strategically located on 800 acres near Kuala Lumpur⁴⁰. It presently has 88 companies, of which three-quarters are in ICT. The core system comprises an Innovation House to help initiate start-ups, Incubator Center for early-stage ventures, and Enterprise Houses for those graduating to good industrial space without services. The congruence of support includes a Resource Center, Master Center (for rapid proto-typing, flexible manufacturing, and robotics), IT-Multimedia Center, and TPM Academy for advanced training together with wide band internet connectivity, R & D plots, and common facilities for recreation. TPM facilitates VC support and has 10 – 30 % equity in five tenant companies.

The SIRIM industrial incubator is focused on advanced manufacturing technology. The Kulim Hi-Tech Park also has incubating functions while the Multimedia Super Corridor has its own incubator at the multimedia university campus, Cyberjaya.

The Malaysian Technology Development Corporation has established Technology Development Centers to facilitate university-research-business collaboration in specific sectors: at Universiti Putra Malaysia (for multimedia work), Universiti Malaysia (electronics and manufacturing), and Universiti Kebangsaan Malaysia (biotechnology and pharmaceuticals). The venture capital industry, essentially state-sponsored, has grown to 33 companies managing funds approaching one billion U.S. dollars.

The relative success of the Malaysian incubation program to date is due in large measure to the convergence of services offered and continuing government support. We see here an emerging triple-helix of close university-state-business collaboration, facilitated by technocratic leadership. The

³⁹ ESCAP regional consultative meeting on technology incubation system, Seoul, August, 2000.

⁴⁰ Maznah Ibrahim, *The Malaysian Incubator Program, International Workshop on TBIs, Bangalore, January 2001*

problems to be tackled are raising scientific research productivity and innovation, finding (and keeping) the good incubator managers, promoting an entrepreneurial culture and transiting from dependence on government subsidy to reasonable self-sustainability (called ‘corporatization’).

Indonesia

With UNDP assistance in 1994, three pilot incubators were established in Java: at PUSPIPTEK tech-park, Serpong; a regional incubator at Solo; and an industrial incubator at Surabaya. By osmosis of experiences, seven more began, many as ‘out-wall incubators’ which also provided out-reach services to businesses in their own premises. Then, Government decided to establish a major national program with many more incubators at universities in the out-lying islands. An Indonesian Business Incubator Association was formed.

With the continuing economic and political turmoil in Indonesia, the program is now in jeopardy when it is most needed.

Egypt

In the 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 have been 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 programs. The implementation of incubators 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 Alexandria⁴¹. Incubators have now been established in Mansura, Assiut, Tabbin, Benha, Fayoum, Giza, Aswan, Gharbiya, Beni Souf, Duweka, Sinai region and the Mubarak Science City. These include mixed business, industrial and technology-based. Today over a dozen incubators are in operation and many more are under planning or implementation. A plan has also been prepared for a resource center for the franchising of prepared ‘livelihood packages’ for rural entrepreneurs, comprising low-cost equipment-process-training advice as well as the leasing of this against buy-back of the goods produced.

The Social Fund has been very supportive in funding the incubator program. The severe problems being encountered presently 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 program is underway by EIA to train 7,500 graduates annually in 40 centers. To date some 2,300 have graduated, of which 43 % are women.

⁴¹ *Master Plan for Business Incubator Network, Business & Technology Development Strategies, 1999*

Turkey

Turkey started a technology incubator program in 1990 (still referred to as Technoparks). Today, KOSGEB, the state small enterprise support agency, provides the full financing for eight incubators linked to the technical universities. Research projects by client-companies are also supported by the state. Rents and fees are low (and go direct to KOSGEB, giving little incentive to the managers to improve their performance or cover their costs).

A good example is the incubator linked to the Middle East Technical University (ODTU) at Ankara. It currently has 25 clients in 1220 sqm of net space and 22 graduated companies.

Poland

UNDP technical assistance in 1990 helped pioneer the concept in Poland, starting with the first incubator in Poznan. The creation in 1992 of the Association of Polish Business Incubators and Innovation Centers became the catalyst for growth. While earlier the incubators were focused on technology commercialization, since 1993 programs have been aimed at creating employment and restructuring the Polish economy, with significant support from the World Bank and EU⁴².

Currently there are about 65 incubators. They have helped start over 1,500 firms and create more than 6,000 jobs. Average space of the incubator is about 2,500 sqm (space to rent – 1,790 sq.m) with 18 tenants each. Investment has been under US\$ half-million per incubator. In the difficult environment for transforming the economic system, Poland has effectively adapted the concept of incubation.

In several small countries there is good 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 University of Technology, **Jamaica**.

In conclusion, the problems of finding local funds, good managers, appropriate building space, entrepreneurial ‘incubatees’ and links to professional service providers continue in the developing and restructuring nations. At the same time, there is now a better appreciation of the potentials and prerequisites and a continuing expansion.

Evaluation of incubator performance

Since the late-1990s, governments, multinational institutions, and other donors are increasingly scrutinizing the performance and sustainability of the support programs that they subsidize. Objective assessments are still awaited in terms of the value-adding services provided by incubator managements as compared to other Business Development Services (BDS).

Metrics

While the concepts of small business incubation are deceptively simple, it is not easy to provide a government decision-maker or private investor with an estimation of the expected benefits from supporting incubators *vis-a-vis* other BDS, in the context of competing demands for funds. Few programs have adequately built into their management systems the routine accumulation and analyses of data on the success or failure of their beneficiaries and of the facility itself. Yet it is precisely these longer-term outcomes that validate the usefulness, impacts and sustainability of incubation.

As business incubation is a fairly recent phenomenon, the history of program evaluation is similarly short. There has yet to be clear agreement on the definitions of ‘success’ or ‘sustainability’ or ‘cost-effectiveness’. Indeed, success – like beauty – is often in the eyes of the beholder. It is essential to have common understanding on basic concepts regarding evaluation methodologies and outcomes.

⁴² K. Zasiadly & K Matusiak, *Business Incubators in Poland, WBIC, Rio de Janeiro, October 2001*

For, as Confucius said: “*If concepts are not clear, words do not fit. If words do not fit, the day’s work cannot be accomplished. If the day’s work cannot be accomplished, morals and arts do not flourish, punishments are not just. If punishments are not just, the people do not know where to put hand or foot*” (*Analects XIII*).

The majority of incubation programs worldwide can be characterized as ‘*public-private partnerships*’ in which initial financial support is received from government bodies – federal, state, city or university. The private sector participates when it sees that the program will lead to greater business opportunities and promote spin-offs. Donor agencies seek to allocate their limited resources to programs that can become *financially viable* following an initial period of development. The ability of a BDS provider (such as a business incubator) to replace the resources it utilizes and generate a surplus is generally evidenced by an analysis of the flow of funds in and out of the system. The *effectiveness* can be expressed in terms of all the benefits derived at the whole system in relation to the use of all resources and the overall satisfaction of those involved. *Outreach* depends on the replicability of the embodied concept and the ability to reach larger numbers of enterprises. With regard to cost-recovery for BDS to small enterprises, it is now appreciated that different services achieve different levels, from say one-third of costs to full recovery.⁴³

Further, the concept of *sustainability* implies the ability to continue achieving positive cash flows in the future and the durability of the benefits achieved. From the perspective of local sponsors and international donors, it is the ability to survive and perform effectively even after the external support has declined to stipulated levels or ceased. This depends, of course, on many factors, especially on the specific local skills to manage numerous opportunities and threats, many of them unpredictable. *For the incubator management, it is often the ability to depend only on reliable sources of subsidy towards a diminishing proportion of its operating expenses.*

Evaluation process

Business incubation involves many players, and the efficiency of each affects the overall effectiveness of the system. Likewise, the evaluation process is multi-faceted, calling for step-by-step analyses of the factors within the incubator and some outside. It must begin at the beginning, that is, with the initial steps of assessing the feasibility and developing the business plan parameters, including the pre-identification of ‘markers’ of progress and performance. (Typically, however, the planners may have decided that it is the business incubator they want (need?) for reasons not easily quantifiable by economists!).

Once started, the sponsors and board have to pro-actively monitor incubator operations, ensuring that performance information is systematically collected, for the clients, graduates and, if possible, control groups operating outside the incubator. Finally, the outcomes (not only outputs) have to be objectively analyzed, the satisfaction of the client and community beneficiaries surveyed, remedial actions taken to overcome weaknesses, and the system re-engineered to enhance performance and realize the benefits – those expected at the outset or as modified in the light of a rapidly changing environment.

An evaluation framework can cover three main sets of criteria: Impacts, effectiveness and sustainability. Measures of performance are the medium-term benefits accruing to the clients, sponsors, local community, region and nation. Some measurable criteria include the enterprises and employment created, growth in the company’s assets, sales turnover and exports, corporate and personal taxes generated, survival rates of the ventures incubated, the technologies commercialized

⁴³ L. Goldmark, *Sorting out the truth: The Financial Viability of Business Development Services, WB-ILO-IDB BDS Conference, Rio de Janeiro, March 1999.*

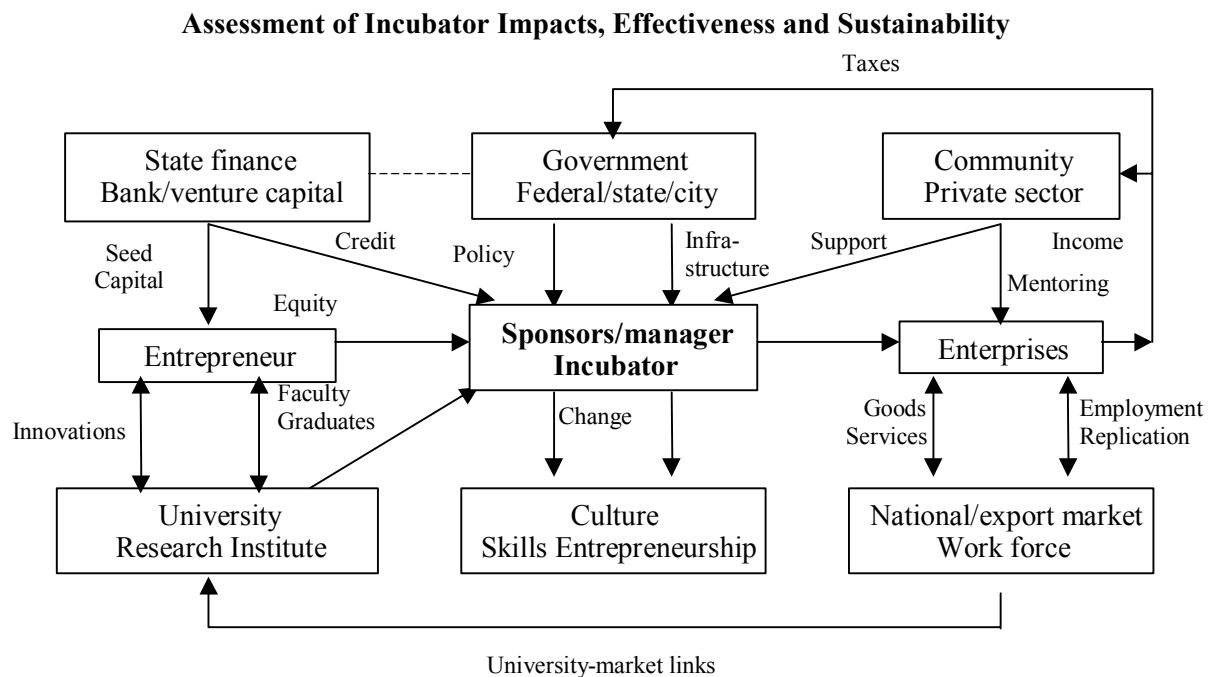
and revenues earned by patents and licensing, the numbers of graduating firms and their outputs, the additionality of benefits at incubating clients as compared to those in the open marketplace.

Other outcomes that are more difficult to quantify include social benefits such as a raised level of public consciousness for small enterprise development, enhanced image of the community as pro-entrepreneurship, skills enhancement, attitudinal changes, increased self-esteem and optimism with respect to the future.

A *performance audit* of a single incubator could be undertaken, to measure outcomes against the expectations of its donors and sponsors. The evaluation requires that donors make provision for -- and pursue -- the timely collection of accurate information by the management, on firms in the facility and those who have graduated, their incomes, employment, taxes and other parameters. The interpretation of audit results has to be honest with rapid follow-up on remedial measures.

Who is best positioned to undertake the performance evaluation? Clearly, the incubator management can perform a continuous internal audit, with the advantage of its insider knowledge. But a definitive evaluation at the maturity of the incubator requires more objectivity and specific experience than the insiders (or an association or advocacy group) alone could provide. Academicians and consultants have their own predilections while some local officials and donors may in fact be averse to learning the true facts. The old-fashioned formula of a *tripartite evaluation* may be a good compromise, involving incubator management, the state/ stakeholder representatives, and independent consultants.

The figure below shows typical loops of inputs and outcomes expected from an incubation system.



Benchmarking of performance

Benchmarking is a dynamic process of identifying good outcomes in organizations which could be attributable to their successful practices and adapting these to another group's operations. It is a *continuous learning and self-correcting process* with quantitative comparisons of performance at participating organizations. It is best undertaken within a region, preferably one which has an

association or focal body to help mobilize a consensus among participating incubators, implement the program, compile and circulate relevant statistics, anonymously if necessary. Poland had pioneered a incubator benchmarking program in 1994, with a group of 11 incubators.

A bench-marking program is intended to assist managements to progressively up-grade their performance, attribute by attribute, in the interests of their sponsors, their tenants, and the incubation industry. The purpose is NOT to find persons to blame or excuses to cover incompetence, but to take prompt, fair actions to remedy the causes of failure and to enhance the effectiveness of performance. Overall, it should help an incubator in the needed transition from the first generation mode (essentially subsidized space and shared facilities), towards a more dynamic operating model (intensive, for-profit services and networking).

At the initiative of DG Enterprise, a major European Union-wide bench-marking program has been prepared by the Centre for Strategy and Evaluation Services, UK. EBN has developed methodologies to assess BICs, in order to support the Commission's 'EC BIC' accreditation arrangements. NBIA has just received a grant from the U.S. Department of Commerce to start a benchmarking program for U.S. incubators.⁴⁴ CASTIP, the association of China incubators, and ANPROTEC, the Brazil association, are well positioned to initiate similar bench-marking programs for comparable groups of their incubators, possibly utilizing the European and U.S. experiences.

To conclude, *Are business incubators really cost-effective?* Performances of individual incubators in both developed and developing countries differ markedly, depending on the quality of infrastructure, predilections of the sponsors, and a variety of other external and internal factors. As noted, methodological complexities, the time and data needed for comprehensive evaluations of incubators pose problems. As a consequence, partial assessments are available which provide evidence of effectiveness and sustainability. This is also true in varying degrees of other business development services.

This begs the question: Do incubators need to be self-sustainable? As noted, governments in many countries consider them to be a part of the infrastructure for creating innovative ventures, helping to overcome market failures and providing 'public goods'. Therefore, they continue to receive some forms of subsidy the world over. And, the numbers continue to grow.

Enhancing incubator performance towards self-sustainability

Our experience in 35 countries on some 150 projects related to starting, operating and evaluating incubators indicates that they can become significant components of a national venture promotion program. But they invariably need initial public support, community consensus on objectives, strong technocratic leadership, realistic expectations together with rigorous follow-up and evaluation.

Based on this work, some essential measures emerge for incubators to thrive, not just survive, as outlined below⁴⁵: Incubators perform poorly for some of the same reasons that their clients do poorly. The lessons are generally straightforward, but are not being applied, due to a variety of reasons, such as: local politics, inadequate financial resources; poor team-work and little sharing of experiences.

Ten lessons (yet to be) Learned, Adapted and Applied

A. Planning issues

⁴⁴ NBIA Update, November 2001

⁴⁵ R. Lalkaka, *Technology Business Incubators: Critical Determinants of Success*, Annals of New York Academy of Sciences, New York, 1996.

1: Initiate the first essential steps of assessing feasibility and preparing the business plan. This requires:

- Rigorous *market assessments of the profiles and needs* of potential incubatees by experts familiar with local conditions, followed by analyses of business plan parameters by those who are to implement the program,
- Selection of strong *public-private sponsors* and an *empowered Managing Board*, willing to invest their reputation, energy and ‘patient money’, with consensus on goals and responsibilities. Also needed, a ‘champion’ who is prepared to fight to overcome obstacles.
- Reservoir of *potential technopreneurs*. In developing countries they may have to be ‘pre-incubated’, to revive repressed entrepreneurial skills and supported even after leaving the BIC
- Select the *type of incubator* most suited to the local market, skills, resources, conditions and culture. While most incubators in developing countries are technology-focused, the special need and imperative of empowering disadvantaged communities must now receive attention.

2: Develop linkages to a sound knowledge base. Successful incubators invariably have strong affiliations to university and professional network, in order to develop:

- Preferred access to or an embedded association with the resources of a major *research laboratory, or technical university*. Importantly, this also provides the aura of respectability for both incubator and tenants.
- Arrangements to enable *graduate students* to work, at small remuneration and/or credits at tenant firms, as well as to *faculty* to augment their incomes through consultant services. The protection of confidentiality becomes essential.
- Well developed *networks of professional friends and alumni*, who may contribute an annual subscription to a “donors club”, provide mentoring to individual tenants, sub-contracting opportunities and serve on incubator advisory committees,
- *Synergistic system* of alliances which provide the financial, banking, technology, marketing and business support, to mutual advantage.

3: Leverage state policy and legislative support, at the city, provincial and central levels.

The supportive environment for sound incubator performance requires:

- *Stable political, economic and regulatory regimes*, providing a sound business infrastructure, initial funds, to facilitate venture creation despite the inherent risks,
- *Competitiveness strategy* which has analyzed and identified the sub-sectors of advantage, selected the change agents and markets,
- *Human resources* development which helps build the full range of specialisations needed, from trainer to technician, innovator to manager.
- *Functioning institutions* for banking, insurance, stock markets, tax, intellectual property and environmental protection.

4: Plan the physical facilities to stimulate creativity, inter-actions (and rental income). Essential features of the facility design to nurture technopreneurs are:

- *Functional and flexible space*, 2,500 sq m and more as needed in future,
- Layout to provide *circulation to help inter-action* between tenants,
- Specific technology-related features such as *Internet connectivity*, effluent disposal, loading dock, storage, and selected shared equipment, but with focus on services, not hardware.
- And, when the stage is set, an *aggressive marketing campaign* using all available media, to promote the benefits of incubation to targeted groups.

While careful preparations are necessary, keep in mind: ‘*Nothing will ever be attempted if all possible objections must first be overcome*’, Samuel Johnson.

B. Operational issues

5: Build a dynamic, entrepreneurial management team. Searching, training and motivating the best possible team is **key** to success:

- **Management team** has to be lean, accessible and supportive, competent in diagnosis and referral but also opportunistic, properly remunerated with incentives for performance. It is noteworthy that some of the most successful incubators are managed by women.
- Its **training**, at home and abroad, are continuous, acquiring new skills for changing needs. Its **time and energy** have to be allocated as much to the tenants themselves, as to strengthening the community network and responding to the sponsors/board.
- The managers must be **proficient in the English language**. In many countries this is not so, and prospective managers should undergo intensive language training to participate in the exchange of experiences, publications and conferences. Also, they must be computer literate.

6: Select entrepreneurial groups with innovative, growth-potential, market-oriented plans Careful choice contributes to the success of both entrepreneur and incubator.

- Word of mouth is the **best promotion**. Therefore, the first batch of tenants should be selected with special care, so the incubator can start a reputation for success,
- Like the venture capitalist, the incubator is looking for the **3 Ms** — Management, Market, and Money, all in short supply in an emerging economy.
- Tenants can be enabled to do a great deal of **intra-incubator business** among themselves.

7: Add value to client-enterprises through delivery of quality services.. The ultimate aim is to launch the early-stage ventures into trajectories of growth through:

- **Tailored programs** of client-centered capacity-building, counseling, information, technology commercialization, sharing-caring services, suited to each cluster of client needs,
- **Networking** with the best professional services in the community and with other SME support programs to secure technology, market, quality and export advice,
- Become more **results-oriented**, exploring innovative ways of delivering services and raising revenues, **focusing on gaps** in the entrepreneur's skills, usually financial management and marketing,
- All at **affordable** terms, but keeping 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.

8: Mobilize the needed investment and working capital for the incubator and its clients. The single greatest hurdle to incubator and tenant operations is requisite finance. Management tasks are to assist the client:

- Secure **information** on credit, equity, royalty, grant and other mechanisms,
- Prepare a **financial strategy and persuasive business plan**,
- Develop in-house **seed capital, purchase order financing, factoring, equity and angel funds**
- Seek '**anchor tenants**' and also serve **affiliates** outside the facility
- **Explore a variety of creative ways**, such as out-sourcing, bulk-buying, and bartering for supplies.
- **Expand profitable services** and drop others, persuading professional firms to provide initial free services in expectation of future business, and
- Extend the **coverage of clients** through virtual, hub-and-satellite arrangements.

The incubation concept is analogous to a symphony orchestra. Just as good instruments and an acoustically perfect hall are desirable, the role of talented musicians and a world-class conductor can be critical to the success of the performance

C. Consolidation and internationalization

9: Monitor performance and evaluate outcomes: As in other human endeavor, success calls for constant vigilance and improved performance, not complacency. Towards this end, the management has to:

- Keep precise and regular *records* of the main parameters of its operations
- *Bench-mark, audit* and *evaluate* its performance compared to its peers,
- Based on this demonstration of its effectiveness, **persuade the stakeholders**, politicians and donors of the benefits/costs of the incubation process in the medium to long-term.
- *Monitor client progress* regularly against its business plan goals, with mentoring by board members and other professionals to facilitate networking and advice.

10: Keep antennas pointed towards emerging trends. Incubator managers in this millennium are becoming more:

- *Professional and forward-leaning*, willing to experiment with franchising and virtual incubation, royalties and angel networks
- *Service-oriented*, with firmer linkages to university, public, NGO and corporate partners,
- *Financially self-sustaining*, with movement towards the venture capital-consultant, co-sharing, for-profit model. Conditions are changing fast in developing countries and what appears unfeasible today may soon become appropriate, even inevitable.
- *Mutually connected*, intra- and internationally, with exchanges of information and experience through national, regional and international incubator networks.
- *Socially-motivated* and willing to transfer their incubation prowess to help build incubators in other parts of the country and region.

Experience confirms that in countries with a supportive environment, the preparatory steps take about 9 to 12 months; another 12 months to secure funding and start, and a further 3 or 4 years may be needed to consolidate operations towards a successful incubator.

Emerging future trends

Business incubation is about two decades old in the United States and Europe, but less than half as old in the developing countries. It certainly should learn from mistakes of SME support systems of the past, and re-define its role for the changing times ahead. With the convergence of services now underway, the incubator as a separate entity is being merged into the larger context of Entrepreneurial University-Learning Enterprise.

The discernible trends for incubators-as-enterprise systems are outlined below.

Planning

The technology orientation so evident in industrializing countries will continue. The galloping developments in ICT, biotechnology, robotics, space and advanced materials will provide new opportunities. Tech-related enterprises can be expected to grow rapidly, calling for the more strategic services of an 'Innovation Center'.

Concurrently, there are emerging opportunities for blending advanced techniques with traditional processes, as in agriculture, textiles, energy conservation and environment-protection. Stronger linkages will be needed to technology sources and users, to the universities, corporations and public research, with locations in physical and structural proximity to technology parks and industrial estates. A 'New Business Center' as an ideaLab within the incubator could be useful. This provides a desk and internet/phone access to a start-up, enabling the preparation of a business model, before entering a full-fledged incubating facility. While in some situations the process of graduation and market-entry would be accelerated, in others the nascent business may be moved to an Enterprise

Center which offers good industrial space without the services.

Further, the imperatives of empowerment and employment call for higher priorities to support structures in rural communities. Special purpose incubator designs are emerging for women entrepreneurs (in Jordan), and for single disciplines such as software (in India), agri-business (in Indonesia and Sri Lanka) and biotechnology (in Brazil). A bottom-up regional development focus for the future will call for better use of local agri-based resources and skills, higher value added in light engineering and chemicals, garments and artisanal goods, for both export and domestic markets. It will operate both within walls and outside through outreach, providing both pre-incubation and post-incubation services. The creation of cyber-incubator and of hubs with satellite systems will offer scale economics, wider outreach and lower costs. Innovative systems such as the franchising of incubator technology itself will emerge.

Operations

With regard to financing incubator development, some governments, as in China, Egypt and Malaysia, have recognized the need for providing the initial funds as a social investment. But many have yet to be persuaded that this is a proper use of public funds. The private sector has generally been absent from the incubator scene.

The vagaries of future state support budgets will put pressure on attaining financial sustainability, and will impose greater responsibilities on the incubator managing board and management. The future incubator professional will have to be technologically versatile, with higher-end financial management, marketing and inter-personal skills, and full immersion in community affairs. This renaissance person, more likely a woman, will have to be fully accredited and better remunerated.

The proliferation of incubators must be accompanied by rigorous, continuous evaluations of their performance. The feed-back of results is intended to enhance operating performance towards sustainability and to demonstrate to sponsors the returns they get from their support. *What many countries now need are not more incubators, but better incubators.*

Internationalization

The International Business Incubator model will serve both indigenous and international small companies. Incubators and their tenant-businesses will have to link up within countries and reach out across borders, in mutual self-interest. Expatriate nationals can be effective in bringing back their experience and capital to their countries of origin, as is now happening in China and India. Governments and local business can create the incentives to encourage such transfers.

National associations of business incubators and technology parks have been operating in Mexico, Brazil, China, and now also in Malaysia, Egypt, Indonesia, Russia, Hungary, Poland and Czech Republic. Such association may federate within multi-country regional groupings, such as NBIA in North America, EBN in Europe, ADT in Germany, SPICE in Central and Eastern Europe, and the newly formed Asian Association of Business Incubators.

The need is emerging for global incubator partnerships. Towards this goal, eleven business associations met in San Jose, California, May 2001 under NBIA auspices, to initiate a structure for exchanges of experience; they set a goal of incubating one million companies worldwide by 2005⁴⁶.

While growth of incubator numbers in industrial countries is slowing down, expansion in industrializing and re-structuring countries will continue at the rate of 10-15 percent annually, Such

⁴⁶ NBIA Update, June 2001

growth will come from countries which are now establishing incubators and variants. Other countries plan significant expansion and major enhancements of existing operations.

Incubator research issues

Individual incubators, their associations and consultants are continually searching for more effective practices and experimenting with options. More structured research approaches are also underway, with the caveat that each situation is different and each solution must fit the reality.

Many Difficult Questions, Few Easy Answers

Some issues needing further work are outlined below:

1. In the **public policy framework**, how can incubators effectively serve as a complement to the other small enterprise support program options?
2. As incubation is being applied to a variety of purposes, what is the preferred system design that can be applied more effectively to increase **employment and empowerment** goals, in urban and rural environments?
3. How does one define '**best**' **practices**, and how indeed can these be adapted to vastly diverse conditions, locally and internationally?
4. As a large proportion of incubators are sponsored either by governments or by universities, what can be done to induce the **private business** and the professional community to play more significant roles, earlier in the process?
5. What are the lessons to be drawn from the recent dot-com incubator debacle? How are the internet, e-learning and virtual incubation systems to be developed more rapidly?
6. Since the **management team** is critical to the success, what is the preferred profile and how should the team be selected, trained, accredited, remunerated, motivated, and retained, possibly using some of the new e-learning techniques?
7. As incubators typically **graduate** only 2 to 4 tenants annually, will an accelerated graduation period of less than three years improve effectiveness and in what situations? How can graduating tenants continue to be assisted? And non-performing tenants identified and removed?
8. How can the **selection process** be better structured, strengthened and streamlined, to better identify entrepreneurial businesses with real growth potential? Indeed, if potential success is the criterion while using public funds, how are the less fortunate entrepreneurs to be served?
9. What are the **metrics for evaluation**, together with the quantification and interpretation of sustainability, additionality, social costs and benefits at the micro- and macro-economic levels?.
10. To move towards incubator **sustainability**, how can income be augmented to cover costs? How can the value of benefits be enhanced to create reasonable returns for reinvestment?
11. What other innovative means can be utilized **to finance tenant operations**? How can the skills and resources for establishing angel networks and venture capital be mobilized?
12. How can incubator services be better **promoted**? And how can the myths surrounding incubation be tackled realistically and their image enhanced?
13. How can national and **intra-national associations** be financed and made more useful to support improved inter-actions? What other systems, including "twining" between incubators (and between tenant companies) be developed?
14. How and who is to incubate an **international incubation system**?

15. Importantly, who is to undertake the above **research objectively** and how would this be funded?

The business incubation process has established many successes under different conditions, but further work is necessary to provide a firm basis for the concept to properly define and reach its potential in the next decade.

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