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**Assessing the Performance and Sustainability  
Of Technology Business Incubators**

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*Abstract*

*There is broad recognition today that entrepreneurial, knowledge-based enterprises are prime creators of economic growth and that such ventures need special business development services. However, there is no consensus yet on the most effective means of providing such support nor on the methods for evaluating the performance of these services. This paper looks at **approaches to assessing the impacts of technology business incubation (TBI)** from the view-points of the clients, the sponsors and the community. The purpose is to measure benefit-costs and to use the results to help the management improve incubator performance.*

*The assessment process has to start with identifying the various inputs and outcomes as pre-determined by the sponsors, then measuring such effects to the extent that the required data is available. Assessment metrics are reviewed. The basic questions that need to be addressed: What are the comparative advantages derived by early-stage ventures within the incubation process as compared to those outside it, and in comparison to other business development services? When does public support for incubation make sense? And can business incubators become financially self-sustainable – and do they need to be? In this context, recent assessments of TBIs in Brazil and China are reviewed.*

*Companion papers review the basic concepts and characteristics of technology business incubation and the emerging for-profit, Internet incubator for the New Economy<sup>2</sup>*

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<sup>2</sup> See “Technology Business Incubation: Concepts, Characteristics, Potential Benefits and Pitfalls” and “Emerging Incubation Modes for the New Economy” also presented at this Workshop

## 1. Background

Since the late-1990s, governments, multinational institutions, and other donors are increasingly scrutinizing the performance and sustainability of the Business Development Service (BDS) programs that they subsidize, including projects for incubating early-stage ventures. There is much discussion on so-called 'best-practices' for Technology Business Incubators (TBIs), but objective assessments are still awaited in terms of value-adding services provided by incubator managements as compared to other BDS, the numbers of graduating firms, their sales, taxes and employment, the technologies commercialized, the additionality of benefits accrued at incubating firms as compared to those in the open marketplace, and other social benefits that are more difficult to quantify. *Questions yet to be fully addressed: Could the market imperfections confronting venture creation be better tackled by other means? And, why indeed do governments still subsidize business incubators (and other BDS)?*

### Basic concepts

The majority of incubation programs in the U.S – and indeed worldwide -- can be characterized as '*public-private partnerships*' in which initial financial support is received from government bodies – federal, state, city or university. Some governments consider them as part of the business infrastructure, and evidence indicates that in well prepared and operated incubators the annual taxes and other benefits from regional economic development can offset the initial subsidy. 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.

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.

Starting in the 1980s, the traditional 'first' and 'second generation' incubators in industrializing countries were focused on affordable workspace and shared office facilities with minimal advisory and networking services. For those wanting to make the transition in this millennium to the 'third generation' technology incubators, the primary

requirement is to enhance the quality of their management, marketing and personnel support for client-companies, actively promote the innovation process, and facilitate access to financing. The legal persona adopted should provide for autonomy and prompt decision-making. The TBI can benefit by linkages to a technology park. Also, it could be university-affiliated, but preferably not university administered, due to the marked differences between the cultures of academia and of business.

Further, as business now moves at Internet speed, the processes of market entry and access to venture finance have also to be speeded up. This form of acceleration in turn requires an advanced infrastructure, the education and innovation systems to generate new knowledge and new products, the capital markets geared to risk, and a steady flow of deals to match market needs.

Historically, business incubation programs are a fairly recent phenomenon. Not surprisingly, the history of incubator program evaluation is similarly short, beginning in the late 1980s with studies by Campbell and Allen (1987), and Allen and Weinburg (1988). These initial studies evaluated business incubation programs largely in terms of the number of new jobs created and the success or failure rates of incubated business in comparison to some imputed success or failure rate for new businesses in general.

An early objective attempt to evaluate business incubation programs in terms of their costs and benefits was a 1990 study of programs in the State of Michigan by Thomas Lyons. In the field of international development, the comprehensive review of incubator programs in seven industrializing countries was the study by Lalkaka and Bishop (1996).

There has to be agreement on the basic concepts and definitions regarding incubators and on evaluation methodologies. 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).

## **2. Assessment process and metrics**

The methodologies for assessing and bench-marking performance are now emerging. 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 forces within the incubator and some outside.

The first step should be to identify the objectives of the sponsors, and develop a consensus on expectations, resources needed and risks involved. Alternative BDS options for achieving these objectives need to be studied and compared. (Typically, however, the planners have decided that it the business incubator they want (need?) for reasons not easily quantifiable by economists!).

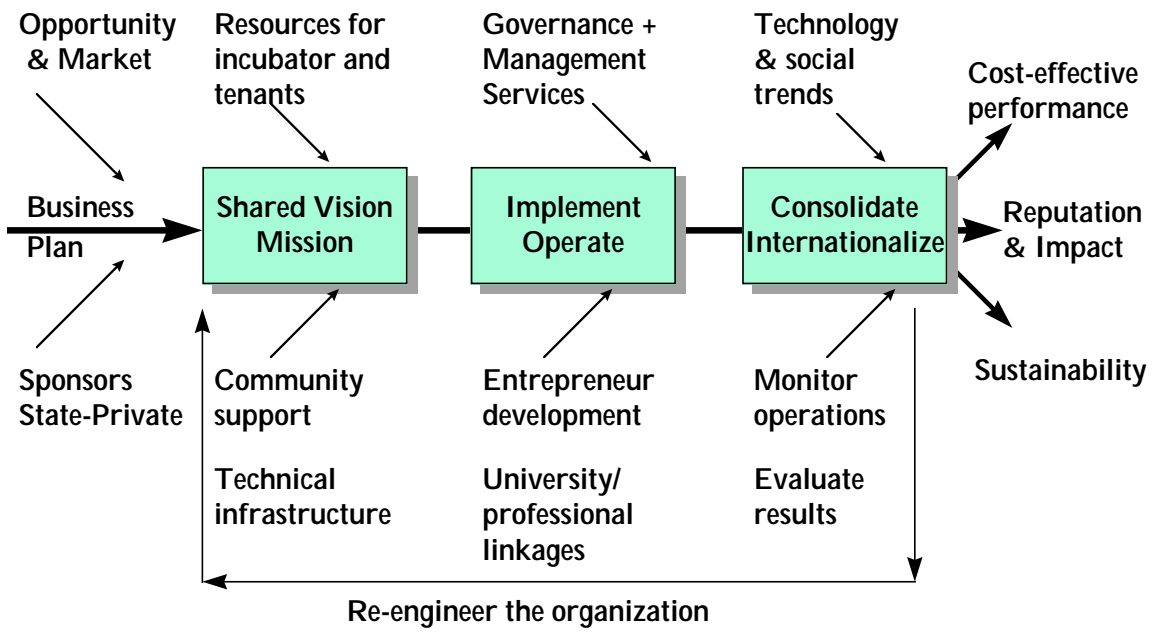
The predilections of the leading sponsor(s) influence the incubation goals. For instance:

<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 may bring a variety of concerns and strengths (and conflicting goals).

The various direct and indirect factors involved in *incubating the incubator* are analyzed together with the location, governance, services and facilities design, all of which will affect its performance. Ideally, the business planning process should identify some quantifiable outcomes at various stages in the incubator development. Next, the model selected has to be implemented and operated, with focus on providing the in-house and externally-networked services needed for the start, survival, and graduation of the client-ventures.

**Figure 1: Incubating the Incubator**



Concurrently, the sponsors and board have to pro-actively monitor operations, ensuring that performance information is systematically collected, for the clients, graduates and (if possible control groups operating outside the incubator). Finally, the outcomes have to be objectively analysed, 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.

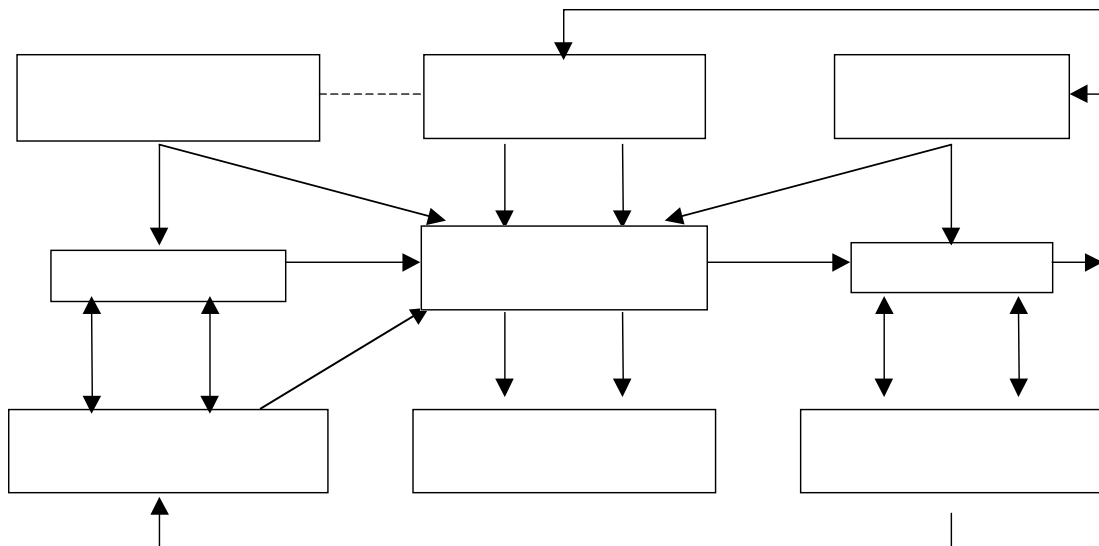
*Who is best positioned to undertake the performance evaluation?* Clearly, the incubator management can perform a continuous internal audit, with the advantage of its insider knowledge. But a definitive evaluation at the maturity of the incubator requires more objectivity and specific experience than the insiders (or an association or advocacy group) alone could provide. Academicians/economists/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 the incubator management, the state/community/stakeholder representatives, and independent consultants.

**Assessment framework**

An assessment framework can cover three main categories: Impacts, effectiveness and sustainability. Good measures of performance of an incubation system 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, and revenues earned by patents and licensing.

Less easily quantified benefits include a raised level of public consciousness for small enterprise development, an enhanced image of the community as pro-entrepreneurship, and social benefits such as skills enhancement, cultural and attitudinal changes, increased optimism and self-esteem with respect to the future. Figure 2 shows typical outcomes expected from an incubation system.

**Figure-2: Assessment of Incubator Impacts, Effectiveness and Sustainability**  
 TaxesGovernmentFederal/state/cityState financeBank/venture capitalEntrepreneurCommunityPrivate secto



The overall system evaluation requires that donors make provision for -- and pursue --

the collection of needed information by the management, on firms in the facility and those leaving, their incomes, employment, taxes and other parameters. While some coefficients can be calculated readily, others require complex social benefit-cost analyses.

The variety of measures that could be considered include those summarized below:

### **I. Impact/Outreach**

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

### **II. Effectiveness**

7. *Employment per net \$ subsidy*: Subsidies are often stealth, coming in different guises and from a variety of sources, direct and indirect.
8. *Taxes paid and returns to state per net \$ of subsidy*: Some studies indicate returns of \$ 4 to 6 per \$ subsidized; this is likely to be "taxes payable" rather than amounts actually paid (which are difficult to ascertain)
9. *Growth of client net worth, sales & exports*: In developing and restructuring countries, this information is generally not shared with state officials or rival businesses
10. *Research commercialized*: Depends on the completion of the transfer, the process of patenting and licensing.
11. *Management dynamics*: Important measures of success are the capability of the team to provide needed services at reasonable profit-margins, to access professional services from external sources, and to win the confidence and

appreciation of the clients. The management in turn depends for support on a pro-active board

12. *Disadvantaged groups*: The extent of facilitated access to resources for peripheral communities, youth, and women, if indeed that is a TBI objective.
13. *Seed venture capital mobilized*: This can be a good indication of the TBIs effectiveness and reputation in the financial community.
14. *Overall profitability of incubator*: What are the returns on overall investment? What are the direct/indirect subsidies still being received? Does the accounting practice provide for depreciation, taxes, and other expenses?
15. *Time to break-even*: How many years from entry of first client has it taken for the incubator income to exceed operating expenses?
16. *Additionality*: A better justification for incubation is its attribute of enhancing the survival and success of its clients compared to those in the open market.
17. *Incubator expansion*: The willingness of sponsors to expand their TBI may be some indication of their satisfaction with outcomes.

### **III. Sustainability**

18. *Revenue surplus (6 years)*: A TBIs cash flow, based on good accounting practices (which do vary among countries) should indicate the overall financial health, towards financial self-sustainability
19. *Services cost recovery*: This depends on the type of services and cross-subsidization. Some such as marketing or accounting can provide 100 % + recoveries while others such as training and counseling only 30 – 50 %
20. *University-business links*: Essential, demonstrated qualitatively by the extent of interactions and support.
21. *Stakeholder satisfaction*: Well-structured interviews can indicate the appreciation of TBI services provided and their overall usefulness to the respective stakeholders
22. *Tenant/graduate satisfaction*: Same as above.
23. *Changes in culture*: Qualitatively perceptible but difficult to quantify, nevertheless a necessary long-term transformation.
24. *Enhancement of entrepreneurial skills and self-esteem*: Same as above, noting however that TBIs do not create entrepreneurs but do nurture nascent aptitudes.
25. *Leveraging state policies*: A major effect in many restructuring countries
26. *Others specific to the TBI*: The predilections of the sponsors or board could require other indicators to be assessed.

### **When does public support for incubation make sense?**

Initially, the private sector assists the incubator through mentoring, in-kind support, 'patrons club', and sub-contracts. Typically, it 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).

Government's initial support to incubators makes sense in some specific conditions:

- When it helps overcome market constraints, improves access to information not freely available, reduces proportion of failed firms,
  - Becomes a visible symbol of the state's commitment to SMEs,
  - Is limited to initiate the incubator-establishment process:
    - not new building construction but a renovated/rented space,
    - not a continual subsidy but till operations are stabilized
  - When an incubator is an extension of the state's role in providing public goods - knowledge, research, tech-transfer, infrastructure,
  - Helps reduce market failures e.g., the lack of affordable, divisible work space, facilities, services, of access to finance, information and other resources,
  - Promotes innovation and entrepreneurship as prime forces in the new economy.
- Incubators have helped address some of the above problems.

The rationale for the incubator as an economic development tool arises from its potential to do some of the following:

- Facilitating the transition from a command to a market economy
- Disadvantaged groups and backward regions empowered
- Mechanism to promote technology commercialization
- Promoting synergy among businesses and with university, research and civil society,
- Reducing costs and consequences of business failures
- Modifying the cultures of risk-taking, teamwork, networking, information sharing
- Creation of jobs (direct, indirect and through multiplier effects) per net \$ subsidy
- Taxes paid by corporations & workers are typically well in excess of net subsidy
- Income, sales and exports generated for the community/country
- Client satisfaction at services received, common costs saved, faster time to market
- Public satisfaction at demonstration of commitment, and Partner (private) satisfaction at return on investment

The experience of the last 15 years in starting, operating and evaluating business incubators indicates that they can become small but significant components of a national small enterprise promotion program. But they need initial government support, a strong management team, community consensus on objectives, clear understanding of constraints, and realistic expectations.

### **3. 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 implement the program and compile relevant statistics. BTDS has participated in a bench marking exercise undertaken by the World Association of Industrial & Technological Research Organizations on scientific research institutes, which provides useful insights.

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. Overall, it should help an incubator in the needed transition from the first generation mode (essentially subsidized space and shared facilities), towards a more relevant and dynamic operating model (intensive for-profit services and networking).

Benchmarking has had mixed results due to difficulties in changing existing work habits and mindsets. You may learn to run the same race faster, but you really may need to be on a different track altogether. Then again, as Will Rogers said, 'Even if you are on the right track, you'll get run over if you just sit there!'

### European Business & Innovation Centre Network Programs

EBN has developed various methodologies to benchmark BICs. This has been done to support the Commission's 'EC BIC' accreditation arrangements and to enable the network to be monitored so that best practice can be shared. Table 1 suggests a variety of benchmarks, from which pertinent data can be selected.

<b>Table 1: Benchmarks for establishment &amp; operation of incubators</b>
<b><u>1. Overall Benchmark</u> –</b>
<u>Operational Benchmarks</u> – length of time taken to establish incubator; scope of partnership and number/type of organisations involved; amount of public/private investment; incubator capacity (space for start-ups); range and type of other facilities and services; number of applications/admissions/graduate businesses; entry and exit criteria; type of firms assisted; charging policy and other financial indicators (see Point 7 below); approach adopted to business planning and monitoring performance against targets.
<b>2. Nature and scope of business incubator support services</b>
<u>Theme</u> – Range/type of support services available
<u>Operational Benchmarks</u> – resources available for business planning, training, marketing, innovation and other types of support; number of projects making use of services; availability of seed/venture capital funding and performance of investments.
<b>3. Key tasks of business incubator managers and partners</b>
<b><u>Headline Benchmark</u> – Number/type of incubator staff/partners</b>
<u>Operational Benchmarks</u> – staffing/board structure; job descriptions of managers; level and type of qualifications; number and type of partner organisations; level of cross-referrals with other business

support service providers; extent of networking with local, regional, national and EU partners.
<b>4. Promotion of business incubator services</b>
<u>Headline Benchmark</u> – Number/type of inquiries for incubator services
<u>Operational Benchmarks</u> – nature and type of promotional activities; approach to defining target market; ratio of inquiries/applications for assistance received; use of ICT in promotion and operation of incubator; awareness of incubator services in local business community.
<b>5. Monitoring and evaluation of business incubator services</b>
<u>Headline Benchmark</u> – Number/type of performance indicators used
<u>Operational Benchmarks</u> – number and type of indicators used; frequency of monitoring activities; level of feedback from clients; procedures for ensuring that client feedback informs management decisions on incubator operations; incubator quality standards and procedures for ensuring compliance with them.
<b>6. Financial Aspects</b>
<u>Headline Benchmark</u> – Assets and turnover of business incubator
<u>Operational Benchmarks</u> – proportion of start-up costs from public/private sources; proportion of operating income from clients (rental income, services, etc), public authorities, private sector sponsors; performance of seed/venture capital funds (if relevant) operating surplus.
<b>7. Performance of Assisted Projects and Regional Impacts</b>
<u>Headline Benchmark</u> – Number/ type of assisted businesses
<u>Operational Benchmarks</u> – proportion of start-ups/existing SMEs; survival rates; type/sectoral characteristics; growth in turnover of businesses; number of net additional jobs created; extent to which graduate businesses remain located in region.

*Source: Centre for Strategy and Evaluation Studies, London, 2000*

### **Enhancing TBI performance**

Measures of incubator success and failure vary depending on context and objectives.

*Incubators fail for some of the same reasons that their client-businesses fail. They fail to perform according to expectations for a variety of reasons, starting in the planning stage and including the following:*

#### *Planning factors*

- No feasibility/biz plan,
- Inadequate pool of entrepreneurs, weak demand for services
- Poor governance, inactive board, no committed champion
- Location with poor business infrastructure
- Inappropriate building layout/ limited space

#### *Operating factors*

- Manager *without* business experience/skills
- Inadequate counseling, information and networking services
- Poor systems for accessing finance for tenants
- High investment and operating costs, under-capitalization
- Insufficient professional/university linkages

- Unfriendly government policies, inadequate support, high taxes
- Little or no involvement of business sector

*But little is said or written about failed incubators!*

The purpose of evaluating performance is NOT to find persons to blame or excuses to cover incompetence, but to take prompt, fair actions to remedy the causes of failure.

The **measures to improve performance** are those which address the deficiencies

- Enhance incomes by raising rentable space and rents as appropriate
- Strengthen the capabilities of the management team by continuous learning
- Core team of specialists to advise networks of TBIs, thus sharing expenses
- Develop profitable services/drop others/recover costs
- Creative financing arrangements, such as equity, royalties, and Islamic banking
- Attract affiliates and anchor tenants, donors and patrons
- Out-source, bulk-buy, barter for services and supplies
- Reduce overheads, interest, insurance charges
- Intensify TBI interactions with board/ business/ state/ NGOs/other incubators and their tenants, nationally and internationally
- Monitor performance, evaluate, take remedial actions

*Plan now towards sustainability, as subsidy will inevitably decline.*

There is a growing body of research on incubation evaluation practices together with training programs for managers, bench-marking initiated recently by the European Business & Innovation Network (EBN), schemes by NBIA on internal evaluation, and by the Japan Business Incubator Association (JANBO) for accreditation of its managers. In addition, systems are required which monitor and facilitate the application of best-practice learning derived from evaluation to enhancing actual performance.

In this context, the recent assessment exercises of the Brazil and China incubator experiences given below would indicate that even rapid analyses based on partial data availability can point to useful results; these can be the starting points for more rigorous evaluations. They alert the incubator managements to the need for better data collection as well as open their eyes to shortcomings on which follow-up action could yield rich dividends.

#### **4. Brazil: Evaluation of TBI Performance**

For the United Nations Development Programme, New York, a rapid assessment was made by Business & Technology Development Strategies LLC of the performances of two technology incubators in Brazil -- Biominas Biotechnology Incubator, Belo Horizonte, MG, and the ParqTec Technology Incubator in Sao Carlos, SP, Brazil<sup>3</sup>. This was based on extensive questionnaires filled out by incubator managements, analyses of

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<sup>3</sup> Lalkaka and Shafer, Technology Business Incubators in Brazil—Assessing Performance, UNDP, 1999

records at the two locations as well as interviews with sponsors and tenants of their opinions on satisfaction with services received.

### **Institutional Analysis Of Biominas And Parqtec**

Incubators need to be sited where there is a strong business infrastructure with availability of scientific talent, good living conditions, and positive government and community support. On these counts, both the Biominas and ParqTec incubators have good locations. Both plan major technology parks linked to the incubators.

**Table-2: Characteristics of Biominas and ParqTec incubators**

	<u>Biominas</u>	<u>ParqTec</u>
Start of operations	1997	1984
Building	Custom-built	Renovated
Gross area, sq m	2,850	1,417
Rentable area, sq m	1,080	550
<b>Tenants, numbers</b>		
Resident	5	15
Affiliates	30	33
Graduates	1	21
Firm survival rate	100%	82%
<b>Tenant concentration, %</b>		
Biotechnology	60	-
Informatics	-	20
Mechanical	-	47
Others	40	33

**Biominas:** Minas Gerais (MG), the second largest industrial state with its capital at Belo Horizonte, has traditional strengths in minerals, mechanical and automotive manufacture, and now in biotechnology. MG has an impressive technical infrastructure, with universities such as UFMG, Vicoso, Ouro Preto and Uberlandia; research institutes Rene Rachou, and FUNED; support agencies such as FAPEMIG and SEBRAE; and a vibrant private sector with BIOBRAS as a world-class insulin producer. Biominas occupies a prime site of 10,000 sq m land adjacent to the publicly-funded, research laboratory - CETEC. It is a custom-built building with excellent biochemical laboratories

**ParqTec:** The city of Sao Paulo is Brazil's major business hub. Some 230 km to the north-west is the city of Sao Carlos, population 200,000, which has the distinction of having the highest density of PhDs in science/ engineering -- one for every 230 inhabitants. Industry is concentrated on consumption goods and mechanical appliances. It has two public universities and private learning centers, laboratories for cattle and animal protein development, and over 70 enterprises in aeronautics, informatics, new materials and robotics. Fundacao ParqTec de Alta Tecnologia houses the CINET and SOFTNET incubators together with related facilities.

### **Financial Viability and Outreach**

Estimates of income and expenses for the two incubators are shown in Table 3 below.

**Table-3: Pro forma income and expense at ParqTec and Biominas Incubators**

All figures in US\$ ,000. Rate R/\$ =0.84

	PARQTEC			BIOMINAS	
	1996	1997	1998	1997	1998
<b>REVENUES</b>					
Rental Income	24.4	38.6	39.4	28.9	81.7
Fees from Tenants	2.1	2.1	2.5	3.1	12.9
Utilities Cost Recovery	9.2	18.5	18.5	-	-
Partnership with SEBRAE	139.4	62.2	239.4	186.0	186.0
	175.1	121.4	299.8	218.0	280.6
<b>TOTAL REVENUE</b>					
<b>EXPENSES</b>					
Manager	27.7	38.6	32.9	36.0	54.0
Admin Assist/tech adviser	0.0	0.7	4.5	10.0	5.0
Lab coordinator	-	-	-	7.0	13.4
Receptionist/Secretary	0.8	2.5	4.2	7.3	14.3
Other Professionals	22.8	26.8	33.4	37.9	48.4
Fringe Benefits	5.9	8.4	10.9	-	-
<b>SUB-TOTAL STAFF</b>	<b>57.3</b>	<b>77.0</b>	<b>85.9</b>	<b>98.2</b>	<b>135.1</b>
Bldg. Maintenance/Cleaning	31.9	70.6	70.6	8.0	17.5
Utilities/Telephone (net)	18.5	24.4	23.5	30.8	48.4
Travel & Promotion	1.3	0.8	20.2	3.2	3.2
Supplies	0.7	1.3	0.7	4.5	9.3
Audit & legal	9.1	9.1	20.2	3.2	4.9
Insurance	5.0	3.8	4.7	-	-
Publications			56.3	-	-
Interest/debt repayment	-	-	-	30.4	39.7
<b>TOTAL EXPENSES</b>	<b>123.7</b>	<b>187.0</b>	<b>282.1</b>	<b>178.3</b>	<b>258.1</b>
<b>OPER. SURPLUS (DEFICIT)</b>	<b>51.4</b>	<b>(65.6)</b>	<b>17.7</b>	<b>39.7</b>	<b>22.5</b>

Such data is hard to collect in most countries. Annual revenue from services (in relation to total) is considered low. Support through the partnership with SEBRAE constitutes more than half of revenue, on average.

Biominas has initiated the feasibility analyses and business planning for a biotech related park adjacent to the existing incubator-CETEC complex. The São Carlos Science Park is on a 172,000 square meter property that it owns in a prime industrial location. Planning and design for the first 3,500 square meter building has been completed. The first structure houses the ParqTec headquarters as well as incubator modules for 64 additional enterprises. The master plan includes two multi-tenant buildings and a convention center.

#### **Cost Effectiveness And Stakeholder Satisfaction**

The evaluation methodology in this case example uses a combination of qualitative description, quantitative analysis, and stakeholder perceptions. The stakeholders

interviewed for this purpose were the public and private sponsors as well as the incubated enterprises themselves. Both incubators have to aggressively recruit more tenants and affiliates as well as increase the throughput of graduating businesses.

The figures in Table-4 below should be considered as preliminary, as it is often difficult to get data from privately-held firms on sensitive topics such as sales, payroll and taxes. At ParqTec, the tenant firms have 69 employees while 17 (of the 21) graduated firms have 168, making a total of 237 direct jobs.

**Table-4 : Jobs and taxes, 1997 (approximate), US \$**

	<u>ParqTec</u>	<u>Biominas</u>
Jobs (tenants and graduates)*	237	92
1997 payroll	\$1,854,000	\$1,030,040
1997 sales	\$9,846,990	\$2,558,320
1997 payroll taxes payable	\$ 463,500	\$ 258,510
1997 corporate taxes payable	\$ 590,820	\$ 153,500
Total taxes	\$1,054,320	\$ 412,010
Investment in incubator	\$ 383,000	\$1,940,000

\*This includes current tenants plus the one graduate tenant at Biominas and 17 graduated firms at ParqTec for whom information is available. Taxes are estimated at 25% on payroll and 6% on sales

As ParqTec has been in operation at its present location since 1990, it has more results to evaluate in compared to Biominas. The 1997 estimate of public capital and operating subsidy for ParqTec and the personal and corporate taxes payable would be approximately as follows, based on the limited data available:

Total jobs (with employment multiplier of 1.5*)	357
Capital cost subsidy per year (20-year straight line depreciation)	\$ 19,150
Operating subsidy per year (average of last 3 years)	\$147,000
<b>Capital and operational subsidy per year</b>	<b>\$166,150</b>
Total subsidy over 7 years	\$1,163,050
<b>Subsidy cost per job (excluding jobs in affiliates)</b>	<b>\$ 3,258</b>
Estimated payroll & corporate taxes by tenants & graduated firms	\$1,054,320
<b>Return on public investment as taxes per year</b>	<b>\$6.34 per \$ subsidy</b>

\* Indirect employment multiplier based on similar economic activities in U.S.

*The subsidy per job should decline at ParqTec as more firms graduate and continue to expand, and as additional incubator space becomes available. For mixed-use incubators, which typically have much larger areas and less services for tenants, the subsidy cost per job can be much lower. A point to note is that while the investment is made once, the jobs continue, and it is useful to think in terms of "job-years" in the stream of benefits.*

*1997 taxes realizable from sales and payroll of ParqTec tenants and graduates could be about six times the subsidy.*

**Performance evaluation by incubator tenants and graduates:**

**Biominas:** Representatives of the present enterprises and the one graduated were asked to evaluate the effectiveness of the incubator as well as the advantages and disadvantages in being tenants. All persons interviewed felt that the program is of value to them, specially help in dealing with bureaucracies resulting in faster permits; Valuable assistance in marketing and faster time to market for new products; excellent infrastructure and labs; Interaction with other tenants.

**ParqTec:** The incubator tenants and graduates interviewed expressed satisfaction with their experiences. Major benefits cited were its: Good location for a startup venture, access to facilities such as labs., telephone, internet, and fax service, valuable marketing and legal assistance and business training on site.

**To summarize,** the ParqTec and Biominas incubators studied have had **positive impacts and outcomes** on their respective city and state economies in nurturing entrepreneurs and creating sound enterprises with good survival rates. 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 public subsidy.

The linkages to universities and research institutes have resulted in commercialization of some technologies. The sponsors and tenants have expressed satisfaction with the results achieved, particularly the help in marketing, business planning, and securing government permits. Both are helping their government sponsors in promoting technological development and other social aspects such as reinforcing the cultures of entrepreneurship and university-research-business cooperation.

*That being said, Biominas and ParqTec have the major challenges ahead of enhancing their operational effectiveness through innovative activities and creative financing, increased occupancy and higher fees for quality services, with more affiliate companies and anchor tenants, in order to reduce the present dependence on state subsidies.*

## **5. China TBI performance**

Incubators in China were a foreign graft that have now taken root in Chinese soil and are flourishing, not merely surviving, In the last few months there has been an efflorescence of new types of incubators and sponsors, with activity in for-profit modes, Sino-foreign joint venture incubators, and government endorsement of fully-foreign owned incubators.

There are about 200 incubator-variants and this number is growing. An international conference on business incubation held in Pudong/Shanghai in April 2000 represented a watershed, with the government committing to make incubators an even greater priority. Over a dozen "virtual incubators", which purport to provide incubation services over the

Internet, have been established both by existing conventional incubators and by private firms. "Internet incubators" affiliated with Chinese and foreign VCs are in gestation and should be operational by early-2001. This is testimony to the considerable vitality of business incubation in China. However, there are legitimate questions that must be raised about the social and economic return on these investments.

There are NO credible evaluations of incubator effectiveness in China. A recent assessment undertaken by BTDS as a "desk study" did not permit extensive field interviews.<sup>4</sup> It relied on documentary sources, supplemented where possible by limited long-distance interviews. We had better access to information, including in Mandarin, on Chinese incubation development than do most others. But the information that exists still needs to be re-checked for completeness and accuracy.

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). Tenant sales amounted to equivalent of about US \$9.5 million average, with profits of about \$625,000.

**Table 5: Performance of Torch Program Incubators, 1998**

Gross floor space	883,620 sq m
Tenants	4,138
Tenant employees	68,975
Tenant sales	US \$735,400,000
Tenant taxes	\$32,000,000
Cumulative No. of Graduates	1,316
Graduates' employees	47,134
Total Seed Capital Funds	\$31,500,000

On a static basis (i.e., lacking in time series data on taxes paid by tenants, and abstracting from the present value of that income stream), government tax receipts from incubated enterprises would pay for the entire investment through 1998 in the 77 incubators in about five years. This excludes the additional value of the social benefits of, e.g., the number of direct and indirect jobs created, the induced increase in taxes paid by suppliers and customers, etc.

Surveys of limited samples of sponsors and tenants at Tianjin, Tsinghua and Hefei indicated overall satisfaction at the performance of these facilities<sup>5</sup>.

Have all the government investments in incubators resulted in a flourishing, localized and sustainable program which confers genuine benefits to startup businesses? It is early to tell, but given current trends, the answer may well be "yes."

<sup>4</sup> Study for UNIDO, Vienna, 2000

<sup>5</sup> Survey supervised by Ma Feng-Ling and Dinyar Lalkaka, March 2000.

This incubator program expansion is primarily a result of large subsidies -- primarily up-front in land and buildings, low-cost or no-cost loans by local state agencies, and some on-going operating subsidies. Generally, no provisions are made for depreciation. There is a continuing demand on low-cost space, even with few services provided but with benefits from the state by being resident in an incubator. Further, 'anchor tenants' (including banks, super-markets, restaurants) help raise revenues.

### **Strengths and weaknesses**

Strong government leadership in an era when market forces were still in the early stages of development has been the main determinant of the performance of China's incubation program. This has been both the source of many its strengths and of its weaknesses. The strengths are outlined below:

- *The size of the incubation program is impressive.* No other developing country has been able to marshal the commitment and resources necessary to develop such a large network in the relatively short span of a dozen years.
- *Significant numbers of enterprises, sales and jobs have been created, technologies commercialized and taxes generated.* This is due in part to the heritage of centuries of scientific prowess and entrepreneurial energy. Further, after initial subsidy, Chinese incubators are generally required to become self sufficient on an operating basis.
- *Chinese incubators have also been a means of creating cultural change.* They have helped bridge the gap between government research and the marketplace, fostering entrepreneurial attitudes, and facilitating the re-entry of Chinese scholars abroad..
- *CASTIP, the incubator association, has been effective in promoting continuous interaction and learning opportunities among the managers of Chinese incubators.* Managers have participated in conferences and training abroad and now invite developing country managers for annual courses in Shanghai.
- *The program has been dynamic and 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'. It has pioneered in such fields as the IBI and equity in companies.

*Overall, the program generally appears to have been efficient in its use of funds and effective in the results obtained.*

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

- *The program has had a narrow organisational base in the MoST's Torch Program.* Little effort was made to create "ownership" by the communities in which incubators are located. Governance continues to be a weak link. Due to the emphasis on technology, the potential of incubators to address many other social and economic issues has not yet been fully explored. The policy treatment of incubators by local governments in terms of legal status, taxation, etc., varies widely.
- *Women and minorities are poorly represented.* For the average person in the street with a bright entrepreneurial idea, it is generally still difficult to gain admission to an incubator simply on the strength of a good business plan.

- *Again, the program is heavily focused on the "hardware" aspects of incubators.* Physical space and facilities have had priority, to the detriment of the "software", i.e., quality business support. Importance of soft services is only now being recognized.
- *The program has not been immune from the dynamics of politics.* Local "empire building" is an important driver of the program. This skews the effectiveness of investment in the program, for example, by reinforcing the emphasis on bricks and mortar and the relative neglect of services.
- *Incubator managements are generally composed of civil servants who have little or no entrepreneurial experience.* This further limits the quality of the "soft" business support services they can provide to their tenants.
- *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.

*As the Chinese incubation program matures, it is in the process of purposefully addressing the weaknesses. In terms of rapid expansion, the program has been outstanding. Qualitatively, incubators in China — as elsewhere — have much to do to rigorously assess their incubator programs and enhance their performance.*

## 6. Lessons (to be) Learned

The experiences outlined above indicate some of the reasons why incubation works (and how it might work even better). These also offer some guidelines for decision making on starting and operating TBI programs in developing and restructuring countries. Lessons emerging (but yet to be fully learned and applied) are summarized below:

1. ***Commit to the core principles of venture creation with business incubation as one catalytic component of a national small enterprise and entrepreneurship development strategy.*** Enterprises (and employment) are created by companies, mainly through individual initiatives; the appropriate role for governments is to develop the business infrastructure, supportive policies, trouble-free regulations and the requisite demand, for this to happen. Incubation is often more successful in the restructuring countries as it helps overcome market failures.
2. ***Recognize that traditional business incubators – like other development services, in developing and OECD countries – require initial state support/subsidy, with the prospect of becoming reasonably self-sustaining at maturity.*** In turn, incubators do provide a variety of benefits, when properly planned and managed. In the restructuring countries, private sector providers of services for small businesses are not yet developed and the state has a bigger role to play. But this should be limited to an initial period of say 5 to 6 years, until the facility demonstrates its effectiveness and the private sector begins to participate. Further, it makes more sense to subsidize the demand for services than to subsidize the service providers.

3. ***Do the homework, starting with survey of the demand for incubation services, analysis of the feasibility and business plan, identification of committed sponsors and realistic objectives, choice of the type of facility needed, and mobilization of community consensus.*** This preparatory work then offers the best chances for future success. Without structuring operations for sustainability, the incubator would continue to struggle and perhaps fail when the public subsidy inevitably declines in future. Ideally, such a study should also consider options other than incubators.
4. ***Choose a location and building that will facilitate the incubation process and enable the incubator to generate sufficient revenues. Recognize also that an incubator is not a real estate operation with big buildings and hardware, but essentially a nurturing environment.*** In most countries it is difficult to find a vacant space or finance to construct a new building. While larger scale of operations may offer lower costs, the new breed of entrepreneurs require quality space and service. In future the focus must shift from bigger buildings to better services.
5. ***Structure the incubator governance and organization to minimize interference and maximize assistance to the tenant companies. This in turn requires the careful selection of managers with entrepreneurial experience, their hands-on training at home and abroad, remuneration (and incentives) that reward performance.*** Researchers, professors or government officials do not usually make good incubator managers. Entrepreneurs, and especially, women entrepreneurs, often do. To meet the needs of qualified managers, a structured training system is now required, which accredits the incubator managers who meet professional standards
6. ***Select early-stage companies with the potential to grow and create good jobs, and organize services specific to their needs.*** In developing country situations, potential 'incubatees' have poor business management/marketing skills and limited finances. This requires that incubator managements take special pre-incubation/probation/post-graduation measures as well as consider variants of franchising of business concepts and vouchers for services.
7. ***Re-engineer the incubation process to take advantage of the exponential growth of Internet applications.*** In the US, Internet and New-media incubators have emerged where venture capital and consulting companies identify innovations and rush them rapidly to the capital markets, not in 2 to 3 years as in the traditional incubators but in 6 to 12 months. Essentially, the accelerator is a convergence of venture capital + strong management consultancy support + a high-tech building.

The Internet is coming fast to Asia: for instance, two years ago there were two million Internet users in China, this year there will be 20 million (almost one-fifth of the current U.S users). For such Internet accelerators to succeed, the current state policies and regulations for joint ventures in the Internet arena should progressively become more supportive and liberal. The advanced developing countries (China, India, Brazil, Malaysia, Egypt, Lebanon included) need to adapt some of these emerging trends.

8. ***Accelerating the venture creation process in turn calls for special measures to promote the expansion of Venture Capital firms linked to technology incubators.*** recent boom in the U.S. economy is due to a culture of risk-taking and the strong drive to create entrepreneurial, knowledge-based ventures, backed by venture capital. The VC commitments have risen ten-fold in ten years, to the level of US\$ 47 billion in 1999. The bulk of this (about 75 %) has been in Internet related businesses.
9. ***Develop a range of counseling services, capacity-building and entrepreneurship development programs, and networking opportunities targeted to the ascertained needs of the tenants and affiliates. The success of the incubator has to be measured by the success of its companies, and the key to success is good services.*** Importantly, these services must be paid for through affordable fees, if they are to be efficient and sustainable. Further, more out-sourcing should be encouraged for advisory, training and accounting services, by developing networks of BDS providers.
10. ***Promote the convergence of support for new venture creation, with the incubator serving as the platform where university, technology park, venture capital, private business and publicly-funded research come together, one reinforcing the other.*** Good examples of such synergy are the Technology Park Malaysia (which started operations with an innovation/incubation/enterprise center as the core, and provision for tech-based enterprises clustering around it)
11. ***Create the associations, chambers, clubs and other structures which can play an advocacy role in promoting the interests of incubators and their members among decision-makers, provide a platform for exchanges of experiences, expertise, training and trade opportunities, both within the country and with counterparts internationally.*** Informal networks and NGOs, with some initial, external support, can be strengthened to help entrepreneurs learn from each other and help themselves.
12. ***Finally, engage in continuous monitoring and evaluation of incubator programs, with actions to improve performance and better serve the members as their needs change.*** The increasing emphasis from donors and sponsors on effectiveness, impact and sustainability calls for serious efforts to collect and analyze data on incubators, in order to enhance operations and justify the state subsidy provided.

The problems for further research are essentially in the areas of information gathering and defining the metrics for evaluation, both the quantification and interpretation of costs and benefits, at the micro- and macro-economic levels. Few programs have adequately built into their management systems the routine accumulation and analyses of data on the success or failure of their graduates, and indeed of the service facility itself. Yet it is precisely these longer-term outcomes that validate (or invalidate) the usefulness, impacts and sustainability of business incubation and other small business development programs.

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