

PERSPECTIVES

presents emerging issues and ideas that call for action or rethinking by managers, administrators, and policy makers in organizations

Toward a Grounded Theory of Effective Business Incubation

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Executive Summary

Business incubators are found all over the world. Yet, to date, no viable integrative theory of effective business incubation exists. This essay outlines a grounded theory of incubation, driven by case studies, empirical results, and field work, based on three main principles that generalize across countries and cultures. They are:

- *The paradox of market emulation:* Successful incubators both emulate market conditions and shield their 'infants' from them. Managing this paradox is fraught with difficulty, not the least because it is often not explicitly recognized.
- *Resolving the key make-or-break constraint:* In every country, there are many constraints that hinder ultimate business success of incubator projects, but there is one key constraint that always 'resonates', i.e., that dominates the attention and concern of project managers. In India, this constraint is funding. In Israel, where the VC industry is mature and liquid, funding is not a major constraint (though as always and everywhere, raising money is a major challenge), but experienced managerial capacity is the resonating factor. Hence, a theory of incubation should include principles that guide identification of the key 'resonating' constraint and provide direction toward reducing or eliminating it.
- *Alignment with local and national cultures:* Culture is a shared, learned, symbolic system of values, beliefs, and attitudes that shapes and influences perception and behaviour. Culture is how values drive behaviour. In national studies of incubation, it is strongly evident how powerfully national culture acts as a mediating variable between, for instance, incubator operations and processes and the national and global business environment. Hence, a theory of incubation should include answers to the following question:

How can incubator processes align well with elements of national and local culture, in order to

- reinforce those aspects of the culture that act positively to help incubator projects attain success
- mitigate or eliminate those aspects of culture that act negatively, and lead to failure?

It is hoped that this work will stimulate other scholars to seek even more important general principles, leading to a powerful general theory of business incubation.

KEY WORDS

Business Incubator

Market Emulation

National Culture

Start-ups

Grounded Theory

Israel

India

An incubator is a device in which prematurely-born babies are kept warm and safe. A business incubator is a programme aimed at keeping 'infant' entrepreneurial companies warm and safe, through a variety of support resources and services, until they are strong and mature enough to leave the incubator and thrive on their own.

The first business incubator was established in the United States, in 1959, in Batavia, NY (Hackett and Dilts, 2004). The European versions, known as Business Innovation Centres, were set up on the initiative of the European Commission; the first one dates to 1984 (Grimaldi and Grandi, 2005). According to Wikipedia:

The US-based National Business Incubation Association estimates that there are about 5,000 incubators worldwide. As of October 2006, there were more than 1,400 incubators in North America, up from only 12 in 1980. Her Majesty's Treasury identified around 25 incubation environments in the UK in 1997; by 2005, UKBI identified around 270 incubation environments across the country. A study funded by the European Commission in 2002 identified around 900 incubation environments in Western Europe.

As incubators proliferated, a vast literature on incubators emerged. Hackett and Dilts (2004) review 38 studies, out of the many hundreds available. There are at least three reasons for the proliferation of incubator studies. First, after job creation became a top policy priority in America and Europe, it was seen that most new jobs came from small and medium-sized enterprises (SMEs), and it was believed that incubators could foster SMEs. Second, increasingly fierce global competition made innovation a top priority for many countries, and incubators, it was felt, could stimulate innovation. Third, incubators lent themselves to case-based research favoured by management scholars.

Much of the literature on business incubators is of the 'critical success factors' (CSF) variety, answering the question, 'What determines the success or failure of incubators and the entrepreneurial projects within them?' But as Hackett and Dilts (2004) note, the research is mainly a-theoretical, while "theory is the lifeblood of any research area." They add:

"...we must turn our attention from 'what' are the most important factors to 'how' and 'why' and 'in what context'...these factors are interrelated."

In this paper, we accept Hackett and Dilts' (2004) challenge and take some initial, preliminary steps in constructing a grounded theory of successful incubation, based on an in-depth study of incubators in Israel and India. A grounded case-based study of incubators in these two countries is vital because contextual factors and culture will *prima facie* play key roles in any theory of incubation. We take a grounded theory approach – in which the theory *emerges* from the phenomenon under study, rather than begin with *a priori* hypotheses – because, we believe, this is the most effective approach for achieving powerful insights into management issues (Maital, Prakhya and Seshadri, 2008), and because the existing vast literature on incubator CSFs lends itself to such an approach.

We begin with a brief review of relevant literature. We then provide three field-based general principles that, we hope, can provide the beginnings of a useful and insightful theory of incubation and that can guide policy interventions. We conclude with some observations on future research.

LITERATURE ON INCUBATOR SUCCESS

As Hackett and Dilts (2004) note, the paucity of theory in the voluminous incubator literature is striking. At the same time, the large number of empirical studies provides fertile ground for grounded theorizing.

Grimaldi and Grandi (2005) discern two unique incubator models: In Model I, incubators focus on reducing start-up costs for incubatees, by providing *tangible* assets, and in Model II, incubators that offer *intangible* assets, such as finance, aim at accelerating speed to market. They stress on the crucial importance of *alignment* – degree of process integration between the incubator's incentives, nature, and objectives and the tenants' requirements. We will, in our theory section, stress other types of alignment, related to national culture.

In general, a theory of efficacious incubation must offer insights on the "fit" between incubator offering, tenant needs, the business environment, and the national and local culture. Because all these dimensions vary widely across industries, regions, and countries, no "one size

fits all" theory of incubators can possibly prevail. Theories that address "fit" meet Hackett and Dilts' (2004) requirement that "incubator-incubation research... demonstrate why incubators are intrinsically, theoretically compelling."

The "critical success factor" approach raises two prickly questions: How is success defined and measured, and how can the trap of intrinsic selection bias (focusing only on successful incubators, rather than on unsuccessful ones) be avoided? Tamasy (2007) argues that incubators are far less successful than they are portrayed, and hence public money should not be allocated to them. She concludes, in her international survey, that "the international evidence clearly shows that recognizing contextual issues is paramount." Context should be interpreted as business, legal, technological, and cultural environment within which incubators operate. This too should become a key part of a general incubator-incubation theory. For example, the study by Hsu *et al.* (2003) of Taiwan's ITRI incubator finds that "the clustering effect in the Hsinchu industrial cluster is the main factor in the ITRI incubator's development" – an example of a key contextual factor. Voisey *et al.* (2006) study incubation in Wales, and argue that success metrics should be broadened; a model to support this view is provided. Voisey *et al.* (2005) examines six business incubation case studies and based on this builds a theory for a "ladder" of incubation, in which the "keen desire for key partnerships with public-sector and private-sector stakeholders" is stressed.

Comparative studies of critical success factors in various countries can be illuminating, for theory construction, when treated as pieces of a very large jigsaw puzzle that need to be assembled. Lee and Osteryoung (2004) compare American and Korean university business incubators (UBI's), and find that their CSFs are broadly similar – except for "clarity and concreteness," which are perceived as more important to UBI directors in America than in Korea. Clarity and concreteness rank high in CSFs for non-incubated projects as well.

Meseri and Maital (2001) study the Israeli technology transfer organizations (TTOs), all with informal or formal incubation processes, and find that "Israeli TTOs evaluate projects in a manner that is broadly similar to venture capitalists and investment banks," i.e., they emulate market criteria.

The picture that emerges from the incubator literature is reminiscent of the poem, "the Blind Men and the Elephant," by John Godfrey Saxe, fittingly set in India, in which sightless people try to picture an elephant by touching its different parts. "Each was partly in the right," the poem ends, "...and all were in the wrong," in the sense that none had a clear vision that embraced all parts of the elephant (incubation process). We seek to envision and understand the whole incubator 'elephant' while examining in detail its component parts.

TOWARD A THEORY OF INCUBATORS: THREE PRINCIPLES IN SEARCH OF A GENERAL THEORY

Italian playwright, Luigi Pirandello, wrote a play in 1921 in which six characters wander on stage and declare that they are searching for an author. We have three principles, gleaned from our case-based field research, that are in search of a general theory of successful business incubation. Here are the three main principles we have so far discovered, together with each principle's foundations in case study and field research.

Principle One: The Paradox of Market Emulation

We find that there is an interesting paradox that lies at the heart of most business incubators. Incubators have, as one of their common ingredients, the opportunity for new ventures to take shelter for, say, two years, from fierce competitive market forces that might otherwise destroy the infant enterprise before it gained size and strength sufficient to compete. This is inherent in the term 'incubator' itself, which is vividly metaphorical.

The fundamental assumption here is one of market failure. Open competitive markets fail to provide conditions that allow many new start-ups to reach a viable size; hence there is need for intervention, in the form of an incubator. The very metaphor, "incubator" implies protecting prematurely born 'infants' from the harsh world, during the initial period.

At the same time, case-study research (Meseri and Maital, 2001) shows that when university incubators choose projects, success rates are the highest when the choice is made according to the same criteria that, for instance, venture capitalists use when making their investment choices. In other words, *successful incubators both emulate market conditions and shield their 'infants' from them.* Managing this paradox is fraught with difficulty, not the least because it is often not explicitly recognized.

For example, one of the pitfalls of incubators is that by providing a warm, safe environment, it eliminates the vital sense of urgency, the go-to-market pressure that non-incubator start-ups experience from day one. We have seen numerous incubator projects fail for just this reason.

A general theory of incubation will include principles that guide incubation processes toward optimal resolution of the market failure-market emulation conflict.

Principle Two: Resolve the Key Make-or-Break Mission-Critical Constraint

In every country, there are many constraints that hinder ultimate business success of incubator projects, but there is one key constraint that always ‘resonates,’ i.e., that dominates the attention and concern of project managers. In India, this constraint is funding. Since India lacks a large and liquid venture capital industry, incubator projects find it exceedingly difficult to find outside funding so that they can leave the incubator and launch their businesses. This tends to make such projects linger and loiter in the safe and protected incubator world, and greatly reduces the incentive to leave. In Israel, where the VC industry is mature and liquid, funding is less a constraint (though as always and everywhere, raising money is a major challenge), but experienced managerial capacity is the resonating factor. Building the team that will build the business requires senior management with global experience. Start-ups particularly need to be global from day one. But, since Israel’s domestic market is small, availability of senior management talent with global experience for start-ups poses considerable challenge in Israel. Incubators that successfully help their resident projects find such experienced management, or in some cases, act as surrogates and at least in part supply it, tend to be most successful.

Hence, a theory of incubation should include principles that guide identification of the key ‘resonating’ constraint and provide direction toward reducing or eliminating it.

Principle Three: Align with Local and National Cultures

Culture is defined as a shared, learned, symbolic system of values, beliefs, and attitudes that shapes and influences perception and behaviour. In other words, culture is how values drive behaviour.

In national studies of incubation, it is strongly evident how powerfully national culture acts as a mediating variable between, incubator operations and processes and the national and global business environment. For instance, Israel has a powerful risk-favouring entrepreneurial culture that stems in part from the country’s history, as a small embattled nation with few resources, forced to improvise in order to survive. But this very culture of improvisation becomes a hindrance, as incubator projects transition to organized businesses with disciplined operational processes. Also, Israel is a nation with a culture of low ‘power distance’ (that is, ‘sergeants’ feel comfortable in challenging ‘generals’ and often do). In contrast, India is a country where risk-taking is often discouraged, and where power distance is relatively high (reflected in the widespread hierarchical structure in organizations). There could be other elements of Indian culture and history, that result in peculiarities such as angel investors and venture capitalists taking disproportionate share of control of the start-up during the negotiation process with the entrepreneur, often leaving the entrepreneur in a vulnerable position with regard to extent of control, that need to be further researched. Hence, a theory of incubation should include answers to the following question:

How can incubator processes align well with elements of national and local culture, in order to (a) reinforce those aspects of the culture that act positively to help incubator projects attain success, and (b) mitigate or eliminate those aspects of culture that act negatively, and lead to failure?

All too often, incubator processes seem to imitate, consciously or unconsciously, those prevalent in America, where the incubation idea was born. Yet, American culture is in many ways an ‘outlier,’ or a special case, with, for instance, individualism far more pronounced than in nearly all other countries, in Europe and especially in Asia. A theory of incubator processes that fails to place cultural alignment at its core will, we fear, continue to reinforce imitation of incubator processes that are unaligned with and unsuitable for many national cultures.

CASE-BASED EVIDENCE IN ISRAEL

Jerusalem Incubator

A technological incubator located on the campus of the Hebrew University of Jerusalem, Givat Ram, known as

Van Leer Technology Ventures, was studied in detail. Some 38 projects that existed within the incubator were studied and characterized as successes or failures. An approach based on some of the principles of Guttman's "facet theory," (Guttman, 1959), by using a variation of "Partial Order of Structural Analysis" was applied, to identify the critical success factors. Then, detailed individual case studies were conducted for a failed project and for a successful one, to validate the statistical conclusions.

Method

Thirty-eight projects were analysed. Of these, 20 were defined as "successful" because they continued to operate for some time after leaving the incubator and 18 were defined as "unsuccessful" because they ceased operation. Each project was rated along three dimensions: (1) technology: quality, innovativeness, and viability of the technology underlying the project; (2) market potential: size and quality of the market in which the product or service would be sold; and (3) people: management skills, leadership capabilities, entrepreneurial teamwork, and entrepreneur personality. A scale of 1 to 4 was used, with 1 indicating "poor" and 4 indicating "excellent."

Each project was first classified as "successful" or "unsuccessful," and then, a graph was constructed for the 20 successful projects and 18 unsuccessful ones. Each project was positioned in the graph, where the 'Y' axis, the joint direction, was the total sum of three scores (technology, market, people), and the 'X' axis, the lateral direction, represented the three separate dimensions. The higher the total score, the higher the project was placed on the 'Y' axis. For projects with equal total scores, those scoring lower on the "people" dimension were moved to the left (e.g., projects C, D are at the same height as, but to the left of, project B). (See Figures 1 and 2).

This method allowed us to compare profiles of entrepreneurship and to see, at a glance, the critical success factors for projects, and compare successful to the unsuccessful ones.

Lessons learned from this case study are as follows:

(1) The human capital factors were the key success factors. Unsuccessful projects failed largely because of the personality and lack of skills of the management team and entrepreneur and their teamwork. As can be seen from the two graphs (Figures 1 and 2), the

Figure 1: Partial Order of Structural Analysis: Successful Projects

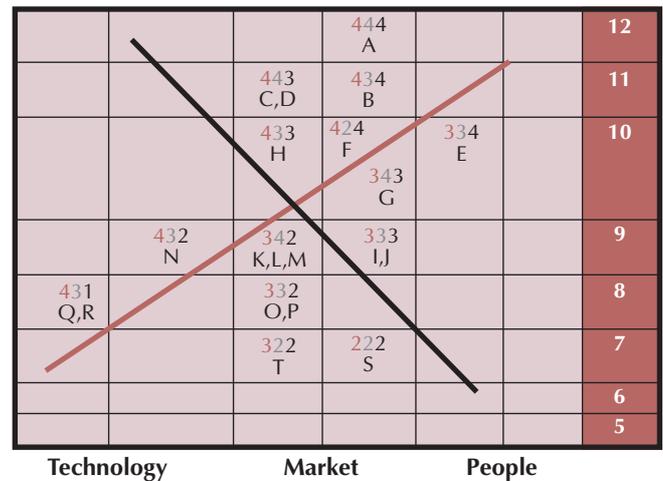
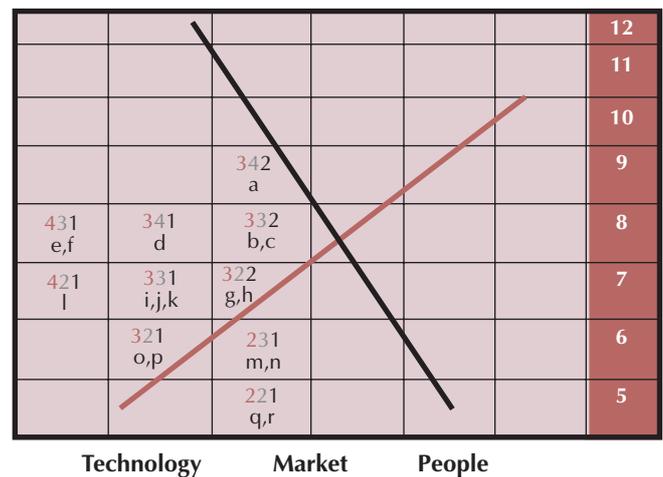


Figure 2: Partial Order of Structural Analysis: Unsuccessful Projects



unsuccessful projects are located far to the left of the successful ones, indicating poorer human resources, but not much below them, indicating that their overall average scores are not that different. For most of the unsuccessful projects, the management capability was very low. The average score of successful projects was 9.15 out of 12; for the unsuccessful ones, it was 7.0. For successful projects, the average score of "people" was 2.8 out of 4; for unsuccessful projects, it was only 1.3, or less than half.

(2) For projects in which the entrepreneur was defined as having an "unsuitable personality," he or she was characterized in general as being stubborn, not open, individualist, unable to communicate, a scientist who does not delegate responsibility to the CEO, having

a large ego and low commitment, and lacking sensitivity. For such projects, the turnover rate of CEOs was very high.

- (3) When selected for inclusion in the incubator, the main criteria were innovativeness and feasibility. Human resources played only a minor role – *probably, a major error in the selection process*. Having a great idea, aimed at a large market, with high innovativeness – these were all necessary conditions, but not sufficient. They must be joined by an entrepreneur whose personality is suited for building a business, a strong management team with high cohesion and managerial skills and capability.

The capabilities of senior management teams and their leaders are key success factors in Israeli incubator projects. Incubators that successfully overcome this challenge achieve greater success, by any measure. This, we believe, is the key constraint to start-up success in Israel. It may not be so in other countries.

Individual Incubator Projects

“K K Rigid” (name disguised): This project was led by a scientist from the former Soviet Union, a true genius, with an outstanding viable idea. There was a proven need for it in industry, with many applications and large market potential. A large company ‘wooded’ the start-up repeatedly. During its two years in the Jerusalem incubator, four CEOs were hired and turned over, because they could not work with the entrepreneur. In times of stress, and there were many, the entrepreneur simply disappeared. Each one blamed the other. In “conciliation meetings” aimed at starting afresh, new directions were defined – and the day after, utterly ignored by the entrepreneur. A beta site was found, comprising an enormous opportunity – but the entrepreneur failed to meet the deadline. *The project was closed. Its IP, potentially of great value, was lost.*

“Barracuda” (name disguised): The entrepreneur showed great enthusiasm, and strong leadership, with excellent communication skills in both Hebrew and English. The product was well-defined, differentiated, and aimed at a clear market niche. The market potential was reasonable, though not large. The development team worked well together and made good progress. An Advisory Board was formed, which strongly supported the CEO. Significant sales were made, at an early stage, to Israel-based clients. After initial success in raising

additional funds, a crisis arose. There were management failures related to defining strategy and conflicts among the Directors. The investors acted quickly to save the situation, and formed a new Advisory Board. A new strategy was defined, and the CEO was strongly mentored. *Disciplined operational processes were defined, all of which led to ultimate success.*

As Jim Collins noted in *Good to Great*, innovativeness must be joined with the culture of discipline in order to achieve success. We found this to be evident in our 38-project sample. For projects whose product is market-ready, the dimension of managing marketing and sales is critical. Companies that left the incubator had to have the leadership and management experience to transition from ‘development mode’ to ‘business mode.’ *Many projects failed this transition miserably, and many were simply not aware of this challenge.*

CASE STUDIES: ACADEMIC INCUBATORS IN INDIA

We studied several Indian business incubators, hosted by academic institutions.

Society for Innovation and Entrepreneurship (SINE)

The Indian Institute of Technology – Bombay (IIT-Bombay) is known to have pioneered the concept of business incubator in India by establishing the Kanwal Rekhi School of Information and Technology (KReSIT) within the campus in 1999 with the support of its distinguished alumnus, Mr. Nandan Nilekani, Co-founder, Infosys Technologies. KReSIT was subsequently modernized into a full-fledged technology business incubator called Society for Innovation and Entrepreneurship (SINE) in 2004 to cover other areas of science and technology. IIT-Bombay is one of India’s premier technology institutions, widely acknowledged as a rich source of technology innovation, research excellence, and technology expertise.

SINE was registered as a society under the Societies Registration Act, 1860. It received financial support from IIT-Bombay and the Department of Science and Technology towards the creation of its infrastructure that is spread over 10,000 sq ft and can host 17 companies. Encouraged by the phenomenal business ideas and overwhelming interest by entrepreneurial start-up companies to be incubated at SINE, the society is expanding its incubator to accommodate 50 companies. Since

its inception, SINE has been very successful in converting and developing technological ideas into products, processes, and services for business by providing high quality physical, technical, and networking support and services, and a nurturing environment.

The incubation programme at SINE primarily supports knowledge-based and technology-based enterprises. However, over the last couple of years, there has been a change in SINE's entrepreneurial focus from IT technologies to other hardcore engineering technologies. The society incubates only product-based ventures. Service-based ventures do not get incubated. Business ideas of only the IIT-Bombay alumni and all those linked to the institution are considered for development and commercialization.

Business proposals that survive a thorough evaluation process conducted by a panel of external reviewers get the nod for incubation. Entrepreneurs are asked for a business plan and market feasibility of their ideas. A thorough analysis of the business plan, especially taking into consideration the industry's and customer's point of view is done by a technical-commercial committee. Entrepreneurs are required to make a presentation to the evaluation committee. If the committee approves the business idea, entrepreneurs then need to sign a memorandum of understanding (MoU). The incubating venture needs to be a company (preferably incorporated before its admission) and gets a residency for up to three years in the incubator. The start-up company housed in the incubator typically has 10-17 members working on the project.

The incubating company is provided access, at highly subsidized rates (at about 75% of the market rate), to quality infrastructure, office facilities (computers, internet, telecom, fully furnished office, etc.), business support services (mentoring support, interactions with legal/financial/ accounting/industrial experts, interaction with investors and industries), workshops and training programmes, and access to data resources. Depending on the project, a company could get seed funds in the range of Rs. 1 million to Rs. 1.2 million (about US\$ 30,000) from SINE. However, this fund is not available to every company by default. All of SINE's projects receive capital support from the Government of India. Periodic review and monitoring of the company is done. Events are organized to help the incubatee company

showcase its products and solutions. When the incubatee company becomes mature, it moves out of the campus and SINE ensures that the changeover is smooth.

SINE has incubated companies in varied domains including companies providing software in financial services, software for the internet, hardware and software for the retail industry, simulator to analyse fatigue and fracture in machines and their lifespan, robotics that aids education, communication and networking, hardware simulation, data security, power generation, quantitative financial models, and geographical information systems. As of January 2007, SINE had successfully incubated 28 projects of which 13 have graduated into companies. Currently, about 20 companies are giving shape to their ideas at SINE.

N S Raghavan Centre for Entrepreneurial Learning (NSRCEL)

Committed to the cause of entrepreneurship in India, NSRCEL was set up at the Indian Institute of Management – Bangalore (IIM-Bangalore) in October 1999. Although IIM-Bangalore's focus on entrepreneurship started in 1994 with the setting up of the Canara Bank Centre for Entrepreneurial Services, a project undertaken by the IIM-Bangalore in collaboration with Canara Bank (one of India's large public sector banks, which funded most of the centre's initial activities), it was Mr. N S Raghavan's substantial grant that scaled the activities of the centre to new heights. The centre was subsequently re-christened as NSRCEL after its primary funder, Mr. Raghavan, one of the co-founders of Infosys Technologies Ltd., retired from the company in the year 2000. Apart from being on the Boards of many companies, Mr. Raghavan is also the chairman of NSRCEL Advisory Council.

NSRCEL's focus is to seed, nurture, and promote entrepreneurship. Its activities span a variety of areas including teaching, research, short-term programmes, seminars/panel discussions, entrepreneurship facilitation initiatives and most importantly, the incubation facility for entrepreneurs. A state-of-the-art 18,000 sq. ft. incubation centre has been created at the IIM-Bangalore campus with the help of Sun Microsystems, that provided the infrastructure, and Global Internet Ventures, that offered a grant of about Rs. 10 million.

A majority of the business proposals received by

NSRCEL are IT-based because of the centre being located in Bangalore, the IT hub of India. However, NSRCEL incubates any start-up—manufacturing, services, technical, etc.—a business idea that is scalable. Further, the centre supports business ideas that come from any aspiring entrepreneur, and the aspiring entrepreneur need not necessarily be from the IIM community. Admission to the business incubator is based on thorough scrutiny of the business proposal of the applicant. The applicant needs to first submit an executive summary of his/her business plan, followed by a discussion with the Chief Operating Officer of NSRCEL. Step two involves making a presentation to the NSRCEL screening committee and holding a detailed discussion with the committee members regarding the business plan, value proposition, and future plans. Business proposals that meet all standards and selection criteria (such as growth potential, commercial viability, potential to generate employment, etc.) are incubated.

On its idea being approved, the incubating company is required to enter into a MoU (Memorandum of Understanding) with IIM-Bangalore. The institute retains five per cent equity in the start-up and the incubating company pays a very nominal amount as licence fee. Incubation services include a faculty guide, an industry mentor, office space and facilities (desktops, workstations, internet connection, telephone, etc.), access to the IIM-Bangalore library, admission to technology forums, and interfaces with angel investors, venture capitalists, legal and financial experts. The period of incubation is generally 12 months and can be extended to 18 months in the case of an exceptional project.

Ten companies have successfully graduated out of the centre, of which five companies have well-established operations in India today, while some of the incubated companies have failed.

Centre for Innovation, Incubation and Entrepreneurship (CIIE)

Set up in the year 2001 at the Indian Institute of Management – Ahmedabad (IIM-Ahmedabad), CIIE has been actively promoting innovation and entrepreneurship through a plethora of initiatives and activities such as incubation, entrepreneurship development, research and training, workshops and seminars, consultancy and organizing clinics for innovators. A host of organizations, professionals, academicians, and networking part-

ners within and outside the country are closely associated with the activities of CIIE. Major stakeholders of CIIE include the State Government of Gujarat, the Department of Science & Technology (DST) and Wadhvani Foundation (a not-for-profit organization founded by Dr. Wadhvani, a successful Silicon Valley, USA entrepreneur and now angel investor/venture capitalist.)

To open its doors to more innovators and entrepreneurs, IIM-Ahmedabad has established the Indian Incubator for Innovation-based Enterprises (I3E) within its campus and is managed by CIIE. I3E helps to methodically nurture and develop entrepreneurial ideas into successful business models and chooses its innovators from the public, private, and informal sectors. Selection of an innovator is based on the approval of the prototype, which is to be developed by him/her. A panel of technical experts evaluates the prototype. Only hi-tech and high impact innovations make it to the incubator. IIM-Ahmedabad enters into a Non-Disclosure Agreement (NDA), service and shareholder agreement (whichever is applicable) with the incubatees. Incubatees are provided with necessary infrastructure in the form of office space and workstations, receive technology support, testing facilities, materials, prototyping facilities, and gain access to databases, legal experts, patent filing experts, IPR consultants, venture capitalists, advertisement agencies, and finance firms. The tenure of incubation is normally 20 months. Mentors, who are a group of two-three faculty members/experts, assist each project. Projects also receive support in areas of market analysis, development of a business plan, prototyping, manufacturing planning, etc.

Foundation for Innovation and Technology Transfer (FITT)

Established at the Indian Institute of Technology - Delhi (IIT-Delhi) as a Registered Society in 1992, the mission of FITT has been 'to be an effective interface with the industry to foster, promote, and sustain commercialization of science and technology in the institute for mutual benefits.' The Technology Business Incubator (TBI) was conceived by FITT in year 2000 to serve as a platform for the promotion of entrepreneurship, primarily among professors, students, and alumni of the institute.

FITT runs incubator nursery programmes, wherein projects are led by one or more members of academic staff, students or alumni of the Institute or is a faculty-

student led project. Such faculty-student led start-up companies are the most preferred for incubation by TBI. Other entrepreneurs eligible for the TBI incubation programme include start-up companies formed by one or more first generation entrepreneurs, and R&D division of the existing SMEs. Business ideas addressing development of products/services that leverage technologies are the ones that get incubated.

The business plan and proposal is scrutinized and appraised by a Standing Screening Committee based on pre-defined selection criteria. Incubating ventures, other than the start-ups of the incubator nursery programmes, are required to foot incubation expenses from their own sources. However, funding for the bridge-capital for incubatee companies is sourced by TBI. Incubatees need to enter into a MoU (Memorandum of Understanding) and license agreement with the institution. Further, TBI has established well-defined guidelines for various financial parameters like equity, loans, space utilization charges, etc., that resident companies need to abide by. Incubator services provided include office space and infrastructure, business facilities, networking with venture capitalists and all necessary access and facilities essential for commercialization of the business idea.

SIDBI Innovation and Incubation Centre (SIIC)

With a view to providing entrepreneurs a platform to bring their innovative ideas to life, the Indian Institute of Technology – Kanpur (IIT-Kanpur) established SIIC in collaboration with Small Industries Development Bank of India (SIDBI).

Ventures that are initiated by one or more members of the academic staff, students, and/or alumni of one of the IITs are most preferred for incubation by SIIC. Besides, technology-based start-up companies promoted by a first generation entrepreneur and Technology/R&D unit of an existing SME are also eligible to apply. The Evaluation Committee evaluates business proposals for residency in SIIC. Approved incubatees are expected to execute a licence agreement (for space utilization) and a MoU with the institute. Limited seed money is provided to incubatees at a reasonable rate of interest. The incubator services include mentoring, business plan development, business promotion, incubation space, office support, access to database and library, access to finance companies, venture capitalists, advertising agencies, and legal experts.

Society for Innovation and Development (SID)

The Indian Institute of Science (IISc), Bangalore is one of India's leading science and technology research institutes that has over the years made significant contributions to the scientific and technological growth of the country. SID was instituted by IISc in 1991 with a mission to 'enable Innovations in science and technology by creating a purposeful and effective channel to help and assist industries and business establishments to compete and prosper in the face of global competition, turbulent market conditions, and fast moving technologies.' In furthering its activities in areas of innovation and entrepreneurship, SID set up an incubation centre in 2004. The activities of the incubator include providing incubating infrastructure, networking opportunities, mentoring panels from the institute and industry to help entrepreneurs achieve their long- and short-term goals; offering courses related to business planning, global market survey, technology assessment, financial management, intellectual property negotiation, and soft skills; interaction and networking with VCs, other financial institutions, industries, experts, mentors/coaches, entrepreneurship associations and Institute alumni; and periodic monitoring of incubatee companies.

Apart from these incubation centres in the top science, technology, and business schools in India, there are a few commercial incubators such as the one promoted by ICICI, a leading bank in India. Two such organizations that provide services to start-ups are now briefly described.

Life Sciences Incubator by ICICI Bank

The ICICI Bank, which is India's second-largest bank, and a part of ICICI (India's premier financial institution providing total financial solutions), in collaboration with the Government of Andhra Pradesh, set up the ICICI Knowledge Park (IKP) in Genome Valley, Hyderabad in the year 1999. The park that is spread over 200-acres has been made a pollution-free zone and is recognized as one of the best Research Parks in the country. IKP houses the Life Sciences Incubator (LSI) to enable scientists, researchers, and entrepreneurs incubate pharmaceutical, biotechnology, and life sciences related ideas. LSI was partially funded by Department of Science & Technology and the Department of Scientific & Industrial Research, Government of India.

The incubation facility is a sprawling 3,200 sq. ft. area that can accommodate eight incubatees. Each incubatee can develop his/her business idea in a module of 225 sq. ft. area, which comprises of a well-equipped laboratory, office facilities (furniture, telephone, computer, internet) and other shared facilities. Other services offered by LSI include business-related services such as assistance in company incorporation, vetting/writing business plans, mentoring and marketing guidance; funding-related services such as lease rentals with minimal initial cost, fund raising, networking with VCs and other funding agencies; other services like regulatory compliances and IP management. To facilitate knowledge sharing, IKP has built a network with key academic and research institutions in the country. Incubatees have access to this rich network along with access to IKP's Virtual Information Centre that provides a database of network members, their library catalogues, and online access to national and international databases.

The eligibility criteria to avail of LSI's services are that the applicant must be either a scientist or an entrepreneur with a life-sciences idea that can be commercialized or a business idea in this domain which requires further R&D. A technical expert committee and the ICICI Knowledge Park Board screen submitted proposals. Ideas that are innovative, sustainable, and marketable get the green signal for incubation. The period of lease of the incubation module is for three years and is renewable.

Since its inception, LSI has incubated 26 companies of which 8 have set up their own facilities. Currently, there are 18 companies doing R&D in areas of pharmaceuticals and biotechnology.

e4e (entrepreneurs for entrepreneurs)

Co-founded by Subhash Chandra, Sridhar Mitta, Somshankar Das, and five others, e4e is a technology holding company that invests in infrastructure services companies. e4e's wholly-owned subsidiary in Bangalore, called e4e Labs Pvt. Ltd. is a technology incubator that invests in Indian technology start-ups. Started out in 2000, e4e Labs provides the start-ups some initial funding and mentors them till they are mature enough to be on their own. The start-ups could be of an entrepreneur based in the US or in India, and e4e stays with the companies that they have invested in, even after the company has gone public. e4e's investors include both

individuals and venture capitalists. e4e focuses on investing primarily in services start-ups, and also funds companies that build technology of relevance to service providers. e4e Labs also does technology development, and these technologies get transferred to the services companies.

LESSONS LEARNED FROM INDIAN INCUBATORS

Our survey of Indian incubators focused on incubators that are fostered mainly by educational institutions.

One of the significant issues of incubators in educational institutions is that most of them do not provide funding for the start-ups, although they arrange networking with angel investors and venture capitalists. However, obtaining funding from these sources in India for a start-up is an uphill and often a frustrating experience, since the angel investment and venture capital industries in India are nascent and typically very risk-averse. This results in technology entrepreneurs having a very difficult time in convincing these sources of funding. So, while quality management is a key constraint in Israel, with venture capital relatively plentiful, in India, finance is probably the binding constraint. The scarcity of funding in India for start-ups inhibits various service providers from providing their expert services to the start-ups, since these start-ups are unable to pay the market rates for services rendered, and the culture of service providers accepting shares in the start-up ventures in lieu of payments is still not widely accepted because of the perceived mortality rates of the start-ups, and resulting perceived worthlessness of the shares.

The cultural aspect is crucial. Israel's culture is one of risk-taking and acceptance of uncertainty. Israeli mothers encourage their sons and daughters to start businesses, in part because of the many legendary successes of Israeli entrepreneurs who have gained indescribable wealth through 'exits.' For instance, two young Israeli entrepreneurs, Arik Vardi and Yair Goldfinger, started a company, Mirabilus ('miracle' in Latin), even before they completed their Computer Science degrees. Their website enabled free download of ICQ software. Some 12 million people did this. AOL bought the company (which never had any revenue or profit) for some \$400 million. This has become part of Israel's modern entrepreneurial mythology. Its cultural influence is hard to overestimate. In contrast, it is known that Indian mothers urge their sons and daughters to find well-paying

jobs with brand-name established Indian companies, to ensure their security. As a result, while Israeli incubators do not need to foster the bold risk-taking attitudes for entrepreneurs, and only need to choose well from a large supply of proposed entrepreneurial projects, Indian incubators probably do need to overcome the cultural constraints that limit the supply of entrepreneurial projects, in part by objectively reducing the risk and uncertainty involved.

CONCLUSION

In the study of business incubator efficacy, it is time to reach beyond the 'what' question – what do successful

incubators do—and instead respond to the questions: 'how,' 'why,' and 'in what context'? We sought to generalize the study of critical success factors into the beginning of a quest for a grounded theory of effective incubation processes. We identified three elements of such a theory. There are doubtless many more.

We hope that scholars of incubation will conduct meta-studies of incubators, building on the large empirical literature, to construct powerful general theories of effective incubation that will add to, extend, and challenge, our principles. ✓

Appendix: Background of Incubation Programmes of India and Israel

Israel's Incubator Project 1991-2006

In late 1989, following a change in American immigration laws that redefined émigrés from Russia as 'economic' rather than 'political' (and hence subject to a 50,000-person yearly quota), many Russian Jews chose to migrate to Israel. In a decade, a million immigrants from the former Soviet Union migrated to Israel. Many had advanced degrees in science and engineering. In addition to infrastructure needs for housing, health care, and education, these immigrants needed suitable employment.

An innovative response was to create technological incubators, under the auspices of the Office of Chief Scientist, Ministry of Industry. In these incubators, ex-Soviet émigrés would partner with Israelis to launch technology-based innovation and build start-up companies. According to the Ministry of Industry (2008): "Through the technological incubators, the government provides entrepreneurs with physical premises, financial resources, tools, professional guidance, and administrative assistance—so that, during their stay in the incubator, they may turn their abstract ideas into products of proven feasibility, novelty, advantages, and necessity in the international marketplace. The entrepreneurs' term of activity in the technological incubator considerably enhances their prospects of raising the financial investment they need, finding strategic partners, and emerging from the incubator with businesses that can stand on their own two feet." Ultimately, about half of all the project ideas implemented within the incubators came from new immigrants from the ex-Soviet Union.

Organization: There are some 26 incubators, scattered throughout Israel as part of the policy to encourage technology-based entrepreneurship in the peripheral regions. The structure of the incubator is as follows: A technological incubator is run and managed by a professional salaried director, a policymaking management, and a projects committee that selects and monitors

projects. The last two governing institutions, the heart and soul of each incubator, are composed of professionals of the highest calibre from industry, business, and science—corporate and industrial executives, R&D managers in high-tech enterprises, professors, heads of faculty in research institutes, and public figures. All of them work on a voluntary basis, with dedication and enthusiasm, devoting their precious time as well as their valuable experience, contacts, and infrastructures of their enterprises and institutions. The incubator is structured to permit ten to fifteen R&D projects to run simultaneously, and is organized and equipped to support the projects in all respects during their stay.

The typical incubator has six functions: (1) Assistance in determining the technological and marketing applicability of the idea and drawing up an R&D plan; (2) Assistance in obtaining the financial resources needed to carry out the project; (3) Assistance in forming and organizing an R&D team; (4) Professional and administrative counseling, guidance, and supervision; (5) Secretarial and administrative services, maintenance, procurement, accounting, and legal advice; (6) Assistance in raising capital and preparing for marketing.

Typically, projects stay for two years in the incubator, and comprise teams of 3-6 people. The budget for each approved project is between \$300,000-\$500,000 for the two years. This funding is provided by the State as a grant, and comprises 85 per cent of the budget; 15 per cent must be raised by the entrepreneur. It is required that any new products resulting should be made in Israel. If the product succeeds, the State expects reimbursement through royalties.

Equity structure: On entering the incubator, each project is organized as a limited liability company; its principals learn to operate the company as a commercial venture. Normally, half the equity resides with the entrepreneurs and developers; 10 per cent, at least, with key staff members; up to 20 per cent,

with the provider of the 15 per cent supplementary financing; and up to 20 per cent, with the incubator itself.

Success measures: As of 2004, some 200 projects were underway. By the end of 2004, 806 projects had left the incubators (in addition to the 200 that remained). Of these, 45 per cent continued while 55 per cent were discontinued. Total private investments in incubator companies totaled US \$773 m. In terms of industry, 11 per cent were in electronics and communications; 11 per cent in software; 18 per cent in medical devices; 19 per cent in chemistry and materials; 19 per cent in biotechnology; and 22 per cent in other areas.

An updated study (2008) by Israel's Technology Incubator Programme, in the Ministry of Industry, reveals the complexity of measuring incubator success (See Table 1). Of 352 companies in incubator programmes included in the study, 68 per cent raised at least some investment funds. Is this a success measure? Some 44.4 per cent of all companies ceased operating or operated without investment funds. Israel is a country where start-ups often make spectacular 'exits,' bought by multinationals. From 1995 through 2007, \$45.6 billion was spent in Israel on acquiring start-ups; of that, \$13.2 billion in 2006-07 alone. Very few such 'exits' occurred for incubator companies. Is this a failure? Many start-ups locate in incubators in peripheral areas; yet often entrepreneurs return to the main cities after their two-year incubation period. Is this too a failure?

Table 1: History of 352 Incubator Projects That 'Graduated'

	Graduated: 352 companies			
Of which:	112 (32%) Failed to raise investment funds		240 (68%) Succeeded in raising investment funds	
Of which:	31 (8.8%) Continued operations	81 (23%) Ceased operations	41 (11.6%) Ceased operations	199 (56.6%) Continued operations

India's Business Incubation Journey

Over the last decade, India has been making a transition towards a market economy. Several initiatives have been undertaken to revolutionize and steer the country's political, economic, and social systems towards a market economy. Creating an environment that facilitates the growth of small and medium enterprises (SMEs) in the private sector has been an important focus of the country in its efforts of transforming the society towards a market economy. India has also been emerging as a country with phenomenal entrepreneurial capabilities, and Indians are

being recognized worldwide for their high levels of entrepreneurial energy and hunger to succeed. In fact, the Global Entrepreneurship Monitor (GEM) Report ranks India as the second most entrepreneurially active nation among 37 participating nations.

The Indian economy today being globally connected and innovation-driven has opened doors to a new league of entrepreneurs who are creating world-class companies (more so in the IT industry) capable of vying with the world's best and winning. India has also witnessed an overwhelming progress in the scientific and technological infrastructure in the country and boasts of having 1,200 technical institutions including 300 universities, 400 national laboratories, and over 1,300 in-house R&D units in various sectors. Highly qualified and experienced professionals and young management/technology graduates are evincing keen interest in wanting to start and grow their own ventures. This apart, many non-resident Indians are returning to India to participate in the country's growing opportunities through entrepreneurship and to breathe life to their own innovative business ideas. The changing face of entrepreneurship in the country, the rise in the number of people wanting to pursue the entrepreneurial journey, and the rise in Knowledge-based Industries/Information and Communication Technology Industries/Bio-Technology Industries in the country have given an impetus to the concept of 'business incubation.'

India recognizes that business incubators are an effective way of fostering the spirit of entrepreneurship and innovation in the SME sectors in the country. While the concept of technology business incubation is still in its nascent state in India, the Department of Science and Technology (DST) of the Government of India, various R&D organizations, and technical/management institutes have taken the lead in promoting incubators in the country. Some of the premier science, technology, and management institutes and universities in collaboration with DST have set up incubators at their campuses. Although these incubators, to a large extent, have been successful in providing necessary physical infrastructure, business amenities, a favourable environment/ecosystem, etc., the networking system to help fund start-ups needs to be developed and strengthened. Venture capitalists in India are not enthusiastic about providing seed capital for start-up companies and angel funding is not yet popular in the country. The power balance in many entrepreneurial start-ups tends to be weighed towards the funders of equity capital such as angel investors and venture capitalists, resulting in the entrepreneur not having a fair deal *vis-à-vis* his counterparts in the developed world. This may also impact the extent of entrepreneurial energy that is infused in the start-ups. In short, the ecosystem for funding new ventures is still in its infancy.

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