The bio-incubation boom in India

Satya Prakash Dash and Gayatri Saberwal

There are already 30 biotech or medtech incubators that have incubated 397 companies (listed). Another 50 are planned. Most are under 10 years old, located in three southern cities and funded by the Government of India. Some have outstanding instrument facilities, others access to a large number of students. Over half can host foreign companies. Rentals and grants are their largest sources of funds; sustainable funding is their biggest challenge. At least one start-up per incubator has achieved Rs 1 crore in annual turnover. We outline an assessment framework for the incubators which form a crucial part of the rapidly evolving entrepreneurship landscape.

Keywords: BIRAC, entrepreneurship, incubation, start-ups, tech-transfer.

AROUND the world, incubators are set up to nurture young businesses with an aim to spur the local economy, transfer technology from academia, create jobs, enhance the chances of business survival and encourage the spirit of innovation and entrepreneurship. Incubators are often set up by local, regional or national governments, in which case they are usually non-profits. Others are either set up as public–private partnerships, by private players (funders or companies), or set up independently and these are more likely to be for-profit. Incubators provide basic lab facilities, high-tech equipment, administrative and business services, a community of several young companies, formal mentoring and the business, investor and technical networks of the incubator and the fellow incubatees. There are over 7000 incubators worldwide[1], with the US hosting over 1250 (ref. 2).

The Government of India (GoI) is also taking steps to spur entrepreneurship. In January 2016, it launched the 'Startup India Action Plan', which encompasses several technology areas and intends to address issues such as funding support, industry–academia partnership and incubation[3]. As elsewhere, India has seen a spurt in bio-entrepreneurship[4]. The term 'bio-economy' captures the multiple ways that biotech companies can impact a nation. Agriculture, industrial production, biodegradable materials, the prevention or clean-up of environmental pollution, drugs, devices and biofuels are some of the areas ripe for entrepreneurship. In parallel to the increase in young firms, biotech incubation is growing rapidly in the country, with the establishment of 30 incubators already. The Action Plan mentions GoI's intention to set up another 50 bio-incubators.

The rapidly changing bio-incubation scenario in the country has not been studied. Here we analyse various aspects of functioning of the existing bio-incubators.

We used a combination of questionnaire and interviews to collect data from the heads of 22 incubators. Of these, 18 provided detailed responses, but 4 incubators were too young to have the relevant data. The methodology, the questionnaire and the interview questions are presented in Supplementary Files 1–3. The four youngest incubators are profiled in short write-ups in Supplementary File 4. The findings of our study are presented below, with additional material in Supplementary Files 5–7.

Profiles of the incubators

The analyses below are based on responses from 18 incubators. Their broad profile is as follows (Table 1): Over two-thirds of them are in the three southern states of Karnataka, Tamil Nadu and Telangana, and most of the activity is in the cities of Bengaluru (Bangalore), Chennai and Hyderabad. The states of Delhi, Maharashtra, Odisha and Uttar Pradesh account for the others. Sixteen are associated with academic (teaching or research) campuses, whereas two are stand-alones. Five incubators are non-profit companies, eight are non-profit societies and five are part of academic organizations and are not registered as separate legal entities. Five are up to three years old, seven are 4–9 years old and six are 10 years or older.

The incubators can either focus on a broad area, such as any tech area, or focus on a few areas such as dairy, poultry and fisheries or on a single area such as medtech or food processing. Most of those that have a well-defined vision or mission are centred on technology development and commercialization through new high tech venture creation. In addition, several have a particular social focus such as students or women.

Satya Prakash Dash was formerly lead Strategic Partnerships and Entrepreneurship Development, Biotechnology Industry Research Assistance Council, 9, CGO Complex, Lodhi Road, New Delhi 110 003, India (e-mail: spdash@gmail.com) and Gayatri Saberwal is in the Institute of Bioinformatics and Applied Biotechnology, Biotech Park, Electronics City Phase 1, Bengaluru 560 100, India (e-mail: gayatri@ibab.ac.in)

Table 1. List of profiled incubators and each one's (a) location, (b) age, (c) floor area and (d) legal status. Also, whether (e) it is part of an academic campus and (f) it can host foreign start-ups. 1A: The incubators that provided detailed information. 1B: The very young incubators, that are profiled with short write ups

	Name of incubator or host organization	City, State	Age (years)*	Floor area (sq. ft.)	Legal status	Part of an academic campus?**	Can host foreign start-ups?
1A							
1	Anna University	Chennai, Tamil Nadu	15	2000	#	Yes	Yes
2	Bangalore Bioinnovation Centre (BBC)	Bengaluru^, Karnataka	2	55,000	Non-profit company	Yes	Yes, if registered in Karnataka
3	Centre for cellular and molecular platforms (C-CAMP)	Bengaluru, Karnataka	6	6000	Non-profit company	Yes	Yes
4	Golden Jubilee Biotech Park for Women¶	Chennai, Tamil Nadu	16	5000	Non-profit society	No, stand alone	To be decided
5	Indian Institute of Horticultural Research (IIHR)'s Horticulture Business Planning and Development Unit (Horti-BPD)	Bengaluru, Karnataka	4	4000	#	Yes	No
6	Indian Institute of Technology-Bombay (IIT-B)'s Society for Innovation and Entrepreneurship (SINE)	Mumbai, Maharashtra	2	12,000	Non-profit society	Yes	Yes, with some conditions
7	Indian Institute of Technology-Delhi (IIT-D)'s Biotechnology Business Incubation Facility (BBIF)	New Delhi	2	3,500 + up to 5000 (dry lab)	Non-profit society	Yes	Currently unclear
8	Indian Institute of Technology-Kanpur (IIT-K)'s SIDBI Innovation and Incubation Center (SIIC)	Kanpur, Uttar Pradesh	4	7500	#	Yes	Yes
9	Indian Institute of Technology-Madras (IIT-M)'s Bioincubator	Chennai, Tamil Nadu	2	3500	Part of a larger incubation cell which is a non-profit company	Yes	Yes
10	Institute of Bioinformatics and Applied Biotechnology (IBAB)	Bengaluru, Karnataka	15	Variable	#	Yes	Yes
11	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	Hyderabad, Telangana	14	12,000	#	Yes	Yes
12	KIIT University Incubator	Bhubaneswar, Odisha	4	30,000	Non-profit company	Yes	Yes
13	National Academy of Agricultural Research Management (NAARM)'s Association for Innovation Development of Entrepreneurship in Agriculture (aIDEA)	Hyderabad, Telangana	3	10,000	Non-profit society	Yes	To be decided
14	National Chemical Laboratory (NCL)'s Venture Centre	Pune, Maharashtra	11	12,000	Non-profit company	Yes	Yes
15	Society for Biotechnology Incubation Centre (SBTIC)	Hyderabad, Telangana	8	Approximately 33,000	Non-profit society	Stand alone, but involved with an academic institution located in another part of the city	Yes

(*Contd*)

Table 1. (*Contd*)

	Name of incubator or host organization	City, State	Age (years)*	Floor area (sq. ft.)	Legal status	Part of an academic campus?**	Can host foreign start-ups?
16	Tamil Nadu Agricultural University (TNAU)'s Technology Business Incubator (TBI)	Coimbatore, Tamil Nadu	6	15,000	Non-profit society	Yes	Yes
17	Villgro	Chennai, Tamil Nadu	16	NA	Non-profit company	Yes	No
18	VIT University's Technology Business Incubator (TBI)	Vellore, Tamil Nadu	14	3,000 + access to other wet lab/animal house facilities	Non-profit society	Yes	Yes
1B							
1	Centre for Cellular and Molecular Biology (CCMB)	Hyderabad, Telangana	0	NA	#	Yes	NA
2	Regional Centre for Biotechnology (RCB)	Faridabad, Haryana	0	NA	#	Yes	NA
3	Indian Institute of Science Education and Research (IISER)	Mohali, Punjab	0	NA	#	Yes	NA
4	Panjab University	Chandigarh, Punjab	0	NA	#	Yes	NA

*For incubators that are multi-disciplinary, the age of the incubator refers to that of the biotech or medtech activities. **An incubator that is either part of an academic institution (involved in teaching and/or research) or located next to one is listed as 'part of an academic campus'. #Not a separate entity (yet). ^Bangalore has been renamed Bengaluru. ¶The whole Park has been considered as an incubator since – from the Park's inception – more than one third of the space has been used for first-generation start ups. The floor area is that of the formal incubator. NA, Not available.

Incubators' core activity is to host start-ups. The facilities usually include high-end instrument facilities, and some of these are outstanding and at par with the best in the world. Those on a teaching campus have access to a large number of young people whom the companies engage with. Older or bigger facilities also have stronger professional networks to help their start-ups. The incubators' other activities include mentoring and training via seminars, workshops and short courses in technical-, intellectual property (IP)- or other legal- or business-related areas. Much less often, the incubator has been able to provide seed funds (usually as the Government's implementation partner) or facilitate funding by banks or others. This is closely followed by networking the start-ups with other firms, and marketing of incubatee products. Even less often mentioned activities are listed in Supplementary File 5. Agricultural incubators are usually associated with academic institutions and commonly help new strains and technologies reach farmers. Amongst others, Venture Centre has a valuable activity which we will probably see more of in future: it has a structured process to take ideas from its parent organization, the National Chemical Laboratory, and spin them off as young companies after proof of concept has been established. So far, this process has yielded 13 firms. We see the beginnings of this in other academic campus incubators too.

Overall, incubators and their environments have a range of strengths. Those that are part of an academic campus, or strongly linked to a network of institutions, feel that the intellectual strength of the campus – which can be multi-disciplinary and can include a large student body – is a huge asset. In particular, those on agricultural university campuses talk of the ready accessibility of technologies developed on campus. Some have the advantage of being located in a hotbed of entrepreneurship. One of them spoke of the extraordinary support from the state government. With the nation-wide increased emphasis on incubation, and the concomitant availability of funds, many expect to ramp up their activities in the near future. Most would like to expand the area available for incubation and some already have funds and concrete plans. Some talk of narrowing their focus to become more specialized (or, alternately to expand their activities), build specialized facilities, allot land for a manufacturing hub, fund their incubatees, transfer more technologies, build more partnerships or become financially self-sustaining.

The incubators' formal collaborations range from nil to comprehensive, with one mentioning that it works with

over 100 organizations. The most commonly reported ones are (a) those with other organizations that strengthen it, such as accelerators or other incubators; (b) tech transfer relationships (to transfer other organizations' technologies, though very occasionally for the transfer of their incubatees' technologies); and (c) to provide consultancy services in technical areas such as IP or field trialling. Although incubators have a range of local, national and international linkages, the international ones tend to be the weakest. Where they exist these may be to help explore commercial possibilities abroad, or to help build capacity in Africa for instance. In terms of their relationships with investors, a few incubators have no such formal arrangement. For the rest, there were three categories of relationships. The most common concerned linkages to non-bank funders, such as companies, venture capitalists, angel investors – including alumni of the host educational institution – and trusts. Five incubators are implementation partners for a total of 8 government funding programmes meant for start-ups and a small number have relationships with banks to regularly assess their incubatees.

In general, the links between the bio-incubators are weak, and based on informal networking. Although the long-standing Indian STEP & Business Incubators Association (ISBA) covers a wide range of business interests, only a few of the bio-incubators are its members. There is also a separate informal network of agri-incubators. Respondents agreed that in view of incubators having fragmented expertise, it would be better to mentor each other to grow faster, but opinion was divided on whether this should be a separate network of bio-incubators, or just a new vertical within ISBA.

Incubator staffing also ranges widely, from one part-time faculty member to 10 full-time staff, based on the funds available. In academic institutions, it is sometimes the faculty who handle the incubator part-time (5 cases), which is perceived as non-optimal. If we consider the head to be a generalist manager regardless of his or her qualifications, in decreasing numbers, the incubators are staffed with generalist managers or operations people, technical staff and staff who handle administrative issues and accounts. Usually, the number of technical staff needs to be increased. This is particularly so where there are high-end instrument facilities, and a model similar to that of the national laboratories – which have dedicated personnel per facility – may be required. Business staff too – who currently may perform a range of activities such as marketing of the incubator or its facilities and providing marketing support for the incubatees' products – may need to be augmented. We anticipate that the number of investment managers will increase as BIRAC disburses more funds to its incubators to invest in their incubatees (http://economictimes.indiatimes.com/small-biz/startups/c-camp-birac-plan-to-sow-their-seed-in-10-startups/articleshow/58466795.cms). It is likely that as experience with incubation grows, the optimal manpower – in-house or on retainership – for a given range of facilities, activities and number of incubatees will be arrived at, and some standardization may take place.

Respondents were asked to comment on their income streams and the fraction earned from each, and likewise the expenditure heads and the fraction spent under each. Six did not provide this information, and an additional two provided information on income but not on expenditure. The categories that account for 80% or more of the income, are (in decreasing order), incubation rentals that may include infrastructure useage fees, grants, and consultancy or services to industry or to other incubators. For some, technology commercialization to farmers, training, corporate philanthropic donations and bank account interest contribute significantly to their income. In terms of 80% or more of the expenditure, salaries are the single biggest item for most, except for a very young one, for which equipment has been the biggest item. Operational and programmatic costs, and administrative expenses and contingency were also mentioned.

Incubators face a range of challenges: (i) the necessity of financial stability and a long-term support system by the government or the private promoter; (ii) the lack of funding for young technology companies (across the pipeline); (iii) the need to identify appropriate mentors for entrepreneurs and to incentivize them; (iv) training and retaining incubator staff and (v) low quality entrepreneur applicants, and, in some cases, the need for professional assistance in screening them, possibly through co-incubation in different incubators. Less often mentioned issues are listed in Supplementary File 5.

Incubatees

The incubators host a varying number of incubatees. Five have hosted a total number of incubatees (in-house and virtual where relevant) in the single digits overall. The rest hosted them in double digits, with three having crossed 50. The latter three, outstanding in terms of numbers nurtured, are as follows: Venture Centre (49/69, and another 82 associated start-ups or pre-start-ups), TNAU-TBI (11/64) and C-CAMP (21/59) where x/y refers to in-house/total number of incubatees and the virtual incubatees make up the difference between x and y. The 18 incubators have hosted (in-house or virtual) a total of 397 young firms (or individuals in the pre-incorporation phase), with others associated less formally. Only a few are mentioned more than once (with 11 duplicates, 1 triplicate and 1 quadruplicate). Some of these have moved incubators, some have moved between virtual incubation in one and physical incubation in another, and yet others are hosted both physically in one and virtually in another simultaneously. Any company that moved between physical and virtual incubation in the same incubator has been

counted only once. Details of these incubatees are provided in Supplementary Table 1.

Some incubators have anchor companies – slightly older firms, with an experienced team, that are doing well. Such firms may provide greater stability – financial or otherwise – to the incubator. They can also be extremely helpful to the other residents. However there is a distinct impression that it takes a certain 'quality of big heartedness' to play this role, and that mere success is insufficient. Occasionally it is just a highly experienced CEO who is very helpful. There are at most two anchors per incubator.

Do foreign firms seek incubation in India? Most incubators have received such enquiries. In a few cases it was large companies seeking a soft landing in India, which was provided. Amongst the smaller ones, most have involved people of Indian origin. Very rarely do smaller firms with no prior connection to the country explore this possibility. Although the country does not have a policy to attract foreign start-ups as do Australia, the EU and Switzerland – which are trying to woo some Indian ones with space and funds – over half of the incubators are allowed to host foreign companies and others may do so in future.

How are the incubatees doing? Most incubatees have received significant external recognition. The accomplishments listed most often were: (a) funding – anything from proof-of-concept to a 2nd or 3rd round – from government or private sources; (b) being amongst the top few in competitions for technology start-ups; and (c) the product or service reaching the market, including, in some cases, exports. Less often mentioned were milestones reached in product development, a tie-up with a large Indian or foreign firm, or a technical collaboration with an Indian or foreign academic institute. Remarkably, each incubator has seen at least one incubatee – while still on the premises, or within a few years of graduating – hit the Rs 1 crore mark in its annual turnover.

The incubators' assessments of the biggest challenges faced by their incubatees were as follows: funding at different stages, including for scale up, marketing support, access to market intelligence and new customers, finding appropriate mentors, hiring and retaining affordable employees, access to (sometimes specialized) infrastructure or equipment, lack of understanding of regulations, delays in regulatory approvals and the time required to comply with all regulations, the need for IP support, and seeking technologies to commercialize. Less often mentioned challenges are listed in Supplementary File 5 and some others, such as the challenges that startups may face once they exit the incubator, are described in Supplementary File 6.

What incubators should be doing

Mirroring the biggest pain point of their incubatees, incubators wish to fund their start-ups, as equity or loans. Also, it is felt that in some cases convertible notes instead of equity would be a better choice, but this route is not legally permissible. Funding was mentioned twice as often as the next issue. Several respondents talked about the need to increase the number of entrepreneurs by building teams around technologies lying on the shelf or to increase incubatees' access to technologies. Some commented on the need for more time and money to liaison with other incubators to share facilities and to understand the sustainability models of incubators abroad. Yet others talked about HR issues: (a) the need for a CEO with sufficient experience in the incubation business, especially for those on academic campuses, (b) the need to establish career paths for incubator staff, something that cannot be done when incubators are run as projects of an institution rather than as a stand-alone organization, and when there is little movement of staff between incubators. There was near unanimity that because bio-incubation is a relatively new phenomenon in India, all staff are learning on the job, and that there is need for proper training. One of the incubators offered to develop a curriculum and provide a diploma in incubation management.

Though mentioned less often, managers feel the need (a) to get industry more actively involved with their incubatees, for product commercialization or technology validation, or by supporting the incubator with their Corporate Social Responsibility funds; (b) to improve mentorship, as by having strong links with academic institutions, or (c) to help incubatees more with market research and identifying marketable products and potential customers.

GoI and some state governments support these incubators. In due course it will be necessary to assess their performance in order to decide on continued funding. Our respondents proposed a wide variety of metrics to do so. Although the incubator landscape is complex – with variability on many parameters – we propose a simple assessment. Adopting a portfolio approach, can we set long-term goals in terms of how many of the start-ups (in-house and virtual, current and past) achieve certain financial goals such as turnover, valuation or acquisition? We discuss this angle in more detail in Supplementary File 7. Incubators might need to prioritize their activities to achieve this.

Conclusion

We anticipate the strengthening of two trends: First, as outlined in the Action Plan, the establishment of 150 tech transfer offices, and second, more incubators moving into acceleration. There has already been a stark change in the landscape of biotech entrepreneurship in the country, driven by BIRAC. As one respondent remarked 'Biotech entrepreneur (in India) – the sentence is incomplete without mentioning BIRAC and BIG.' Start-ups – many of which

are IP-driven[4] – are supported in more ways today and there is a greater continuum in the available funding for different stages of the company. There are different types of founders – the business savvy professional who may already have been the CEO of a few companies; the experienced academic starting on this journey; and the younger folk full of enthusiasm and energy but without experience. Incubators play important, but different roles for each of them. As these incubators are strengthened, there will be more tools in our kit to handle global challenges in areas such as food, fuel and health.

Competing interests: The authors declare no competing financial interests. S.P.D. was a full time employee of BIRAC, a non-profit Public Sector Company when this study was carried out. Both authors served (G.S. continues to serve) as members of the Expert Committee, BioNEST (Bioincubators Nurturing Entrepreneurship for Scaling of Technology), BIRAC, Government of India. Additionally, GS serves as a Member, C-CAMP Incubation Advisory Committee. SPD carried out this work in his personal capacity. The views represented here are not necessarily those of BIRAC, which has played no part in conceiving of this study, in implementing it or in deciding what or where to publish.

1. Al-Mubaraki, H. M. and Busler, M., The effect of business incubation in developing countries. *Eur. J. Business Innovat. Res.*, 2013, **1**, 19–25.
2. Grens, K., Incubator boom. *The Scientist*, 1 March 2014.
3. Anony., Action Plan. Department of Industrial Policy and Promotion, Government of India, 2016; http://startupindia.gov.in/actionplan.php.
4. Saberwal, G., India's intellectual property-based biomedical startups. *Curr. Sci.*, 2016, **110**, 167–171.

ACKNOWLEDGEMENTS. We owe deep thanks to the respondents for giving generously of their time to answer the questionnaire and to be interviewed. We also thank Prof. H. S. Subramanya of IBAB for discussion, especially with regards to the assessment framework for incubators.

Received 8 July 2017; revised accepted 4 April 2018

doi: 10.18520/cs/v115/i2/228-233