

BUILDING AN ENTREPRENEURIAL ECOSYSTEM FOR TECH START-UPS

A CASE STUDY OF THE ROLE PLAYED BY A PRIVATE UNIVERSITY

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Abstract

The promotion of entrepreneurial ecosystems for tech start-ups through policy initiatives is a recent development in India. As of now, tech start-up hubs are predominantly confined to Tier-1 cities, particularly Bangalore, National Capital Region (NCR) Delhi, Mumbai, Hyderabad, Chennai and Pune, and the emergence of tech start-ups in Tier-2 cities is an exception than a rule. This is primarily due to the absence of a conducive entrepreneurial ecosystem for nurturing tech start-ups. However, a private technological university in a Tier-2 city (Hubli) in Karnataka has slowly but steadily taken exceptional leadership initiatives towards the building up of a nascent ecosystem for generating tech start-ups. How did this happen? What results did it yield so far? Given the current scenario, what prospects does the ecosystem have for the future? This article explores and throws light on these issues.

Introduction

University promoted incubation to assist the growth of spin-off firms through a dedicated facility providing subsidized space, consultation and other services and support to encourage technology entrepreneurship is a noted worldwide phenomenon (Etzkowitz, 2002). This is done through, what is commonly known as, Technology Business Incubators (hereafter TBIs). In fact, universities constitute one of the Triple Helices and TBIs form one of the indispensable components of an entrepreneurial ecosystem for technology based start-ups (Bala Subrahmanya, 2017a). TBIs provide a mechanism for technology transfer and commercialization for new venture creation (Wonglimpiyarat, 2014). Over a period of time, they have become one of the most successful tools to mentor start-up ventures (Jordan, 2010).

Today, TBIs are present in many parts of the world that facilitate development of regional innovations through industry-institute interactions (Thursby and Kemp, 2002). More often than not, TBIs are

sponsored and promoted by academic institutions/universities, mostly in fairly well-developed technology/innovation clusters which has a strong base of university research (Mian et al, 2016). However, they can also be found in institutions that do not perform basic research, but which have strong links with the infrastructure of science and technology and the commercialization of technologies (Breschi and Lissoni, 2001).

But, in an emerging economy, particularly in a city, which has the presence of neither a well-developed entrepreneurial ecosystem nor a strong university research base, initiating a TBI and thereby driving the creation of an entrepreneurial ecosystem for technology based start-ups is quite a challenge. The hurdles to bring together the ecosystem components for enabling ideation, commercialization of innovations and technology transfer for creating tech start-ups will be numerous and daunting, to say the least. Given this, how did a private engineering institution (which later became a full-fledged

university) overcome the multiple challenges towards creating a nascent ecosystem for tech start-ups in a Tier 2 city through the establishment of a TBI is interesting to examine and analyze. This is done by means of an exploratory case study for KLE Technological University (which was earlier known as BVB College of Engineering) in Hubli, Karnataka.

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, and relies on multiple sources of evidence (Yin, 2014). A case study is a complete analysis of an individual subject with respect to specific phases of its totality (Krishnaswamy et al., 2006). The advantage in using case studies as a method of business research is that they offer rich and reliable results due to the combination of both quantitative and qualitative data collection and analysis methods and the triangulation of information from multiple sources (Robson, 1993).

Role of academic institutions and TBIs in an ecosystem for tech start-ups: A review of literature

The creation, sustenance and growth of a tech start-up involve a considerable degree of uncertainty and challenge to its founders/promoters, due to three important factors, which are as follows:

- (i) These tech start-ups are unfamiliar and without precedence and therefore suffer from the liability of newness;
- (ii) They are generally created on a small scale with limited resources; and
- (iii) They often, directly or indirectly, face established competitors, powerful suppliers, sceptic customers and hesitant financiers.

Given their limited internal resources and strength, they tend to depend on the local environment for critical resources which

are essential to sustain their operations (Romanelli and Schoonhoven, 2001; Bala Subrahmanya, 2015). Start-ups which are promoted in a structured and vibrant entrepreneurial ecosystem have higher chances of success compared to the rest, because such ecosystems have a positive impact on start-up fertility, stability and growth (Arruda et al., 2013; Cukier, 2016). A strong entrepreneurial ecosystem in a region will have the ability to promote technological innovations and development of business environment for the growth of tech start-ups in that region, which in turn, would promote employment generation and national income in an economy (Krajcik and Formanek, 2015). Due to these reasons, policy makers in the world's most dynamic areas explicitly focus on promoting entrepreneurial ecosystems for start-ups (Manzella, 2015).

Though several empirical studies have defined entrepreneurial ecosystems for start-ups in different ways, there are found to be some common components which are interlinked with one another in the process of start-up creation, sustenance and growth. In a broad sense, an ecosystem for start-ups is defined as a set of interconnected entrepreneurs (both potential and existing), entrepreneurial organizations (e.g., firms, venture capitalists, angel investors, banks), institutions (such as universities, public sector organizations, and financial agencies), and entrepreneurial processes (consisting of business births, number of high growth firms, levels of 'blockbuster entrepreneurship', number of serial entrepreneurs, degree of sell-out mentality within firms and levels of entrepreneurial ambition) which formally or informally consolidate to connect, mediate and govern the performance within a local entrepreneurial environment (Mason and Brown, 2013). Thus, a start-up ecosystem comprises entrepreneurs, different kinds of financial support such as debt finance, equity investments and grants, non-financial support in the form of incubation, acceleration support, mentoring and technical experts. In addition, it includes government policies and programmes relevant to start-ups, academia and other organizations which in different ways interact with start-ups (CII, 2015).

There are two unique entrepreneurial ecosystems for tech start-ups in the global economy which are often cited as the benchmarks, namely, Silicon Valley and Israel. Both have generated more successful start-ups than other nations could create in years or decades, and they are not identical but distinct in their respective ambiances (Arruda et al., 2013). This brings out that different nations with different economic environments, can build their own entrepreneurial ecosystems to nurture successful tech start-ups. There is no exact formula for creating an ecosystem, but there are only practical, though imperfect, road maps (Isenberg, 2011). This implies that it is not possible to replicate either a Silicon Valley or an Israel, rather what is significant is to identify and promote the key benchmark elements of an ecosystem for nurturing tech start-ups.

It is equally important to note that entrepreneurial ecosystem for tech start-ups is dynamic in nature. Ecosystems change from time to time, in terms of people, organizations and environments. This could be due to differential talent pool, resource base, cultural attitude and support structure, created/emerged over a period of time. Further, the introduction of non-native people, knowledge and skills can cause substantial shifts in the ecosystem functions (Isenberg, 2011). This enables us to derive three inferences, which are as follows:

- (i) Even within a country where start-ups are subjected to the same macroeconomic policy environment, entrepreneurial ecosystems in two different regions are unlikely to be similar;
- (ii) The spontaneous or induced influx of non-native people with knowledge and skills, resulting in cross-cultural migration, would facilitate an entrepreneurial ecosystem to experience substantial improvements; and
- (iii) Where there is hardly any presence of an identifiable entrepreneurial ecosystem, internal initiative or external intervention or both can lead to a slow and steady emergence of ecosystem components thereby cultivating an

ecosystem for the benefit of tech start-ups.

The above discussion enables one to understand that entrepreneurial ecosystems are crucial for nurturing tech start-ups, and these ecosystems can be defined in terms of certain common components and their functions. Further, an ecosystem is dynamic in nature as it can be nurtured/developed in a region, over a period of time. Given this, it is appropriate to know the key elements which can drive the creation/development of an entrepreneurial ecosystem in a region.

There are nine core issues concerning an entrepreneurial ecosystem for tech start-ups, which are as follows: (i) sources of entrepreneurship, (ii) finance, (iii) market, (iv) human resources, (v) support structure (including accelerator/TBIs/proof of concept centres/prototype/product development & testing centres), (vi) business & technology mentorship, (vii) policy, (viii) culture, and (ix) media. These nine core issues are provided or promoted by one or more of the four key elements, namely, (i) large companies (domestic as well as foreign), (ii) tech start-ups (in different stages of their lifecycle), (iii) education & research institutions, and (iv) governments (regional and national) (Figure 1) (Bala Subrahmanya, 2017a). The four key elements broadly fall under (i) Government (G), (ii) Academia (A), and (iii) Industry (I), which constitute the Triple Helix model, as originally proposed by Etzkowitz (2003).

It is this Triple Helix and its interactions which form the base or support structure for an entrepreneurial ecosystem. Within the Triple Helix model, an entrepreneurial ecosystem would comprise a nucleus consisting of tech start-up and prospective tech start-up entrepreneurs, with two outer layers. The first outer layer will include indispensable (primary) components consisting of (i) sources of finance such as seed funds, angels, venture capitalists, private equities and investment banks, (ii) market, (iii) human resources, (iv) support system comprising accelerators, TBIs, co-working spaces, common facility centres, common technology platforms/laboratories, and (v) business and technology mentors. The second and outer

most layer will comprise supplementary components such as (i) supportive local culture, and (ii) supportive media. The primary components are those without which an ecosystem will not emerge or sustain or be effective, whereas secondary components are those which play only a supportive role

(Bala Subrahmanya, 2017a). A typical structure of an entrepreneurial ecosystem for tech start-ups feasible in the Indian context, as defined by Bala Subrahmanya (2017a), is given in Figure 2.

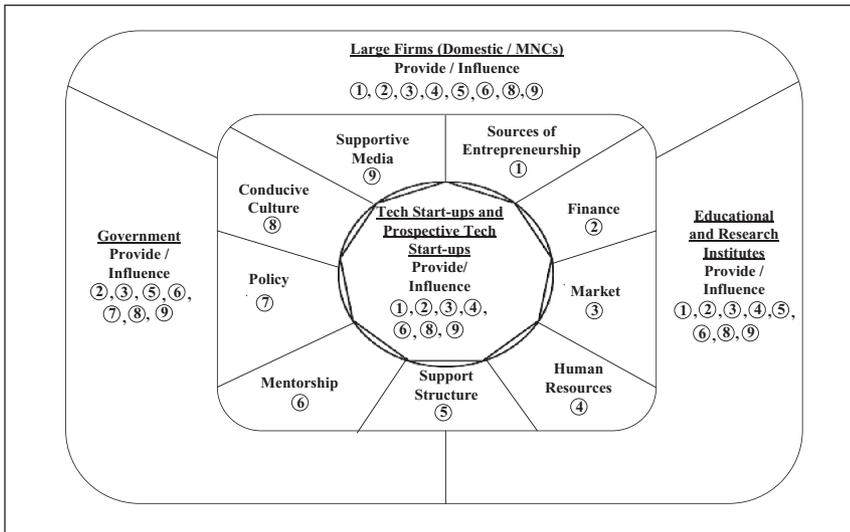
A triple helix interaction typically starts as university, industry and government

enter into a reciprocal relationship with each other in which each helps to enhance the performance of the other. Most such initiatives take place at the regional level where specific contexts of industrial clusters, academic development and presence of governing authority influence the development of the triple helix (Etzkowitz, 2007). It is the triple helix interactions which generate or influence the primary and the secondary components of an entrepreneurial ecosystem in a region (Bala Subrahmanya, 2017a).

The triple helix interactions driven by public policy initiatives leading to the emergence and growth of an entrepreneurial ecosystem for tech start-ups over a period of about six decades, is empirically illustrated by Bala Subrahmanya (2017b) in the context of Bangalore and Hyderabad. Public policy initiatives laid the foundation for the creation of academic institutions, public sector enterprises, and public R&D institutions which led to the creation of a modern industrial cluster in Bangalore by the mid-1980s. Subsequently, it was the entry and growth of MNCs in the IT and BT sectors followed by an increasing entry of MNC R&D affiliates (both in response to steady economic policy liberalizations) which created the IT/BT industries cluster by the late 1990s/mid-2000s followed by an R&D centres' cluster by mid-2000s/late 2000s. These three clusters, with the aid of Government (G), Academia (A) and Industry (I) together played a decisive role in the gradual emergence and growth of different components of an entrepreneurial ecosystem for tech start-ups in Bangalore as well as Hyderabad (Bala Subrahmanya, 2017b).

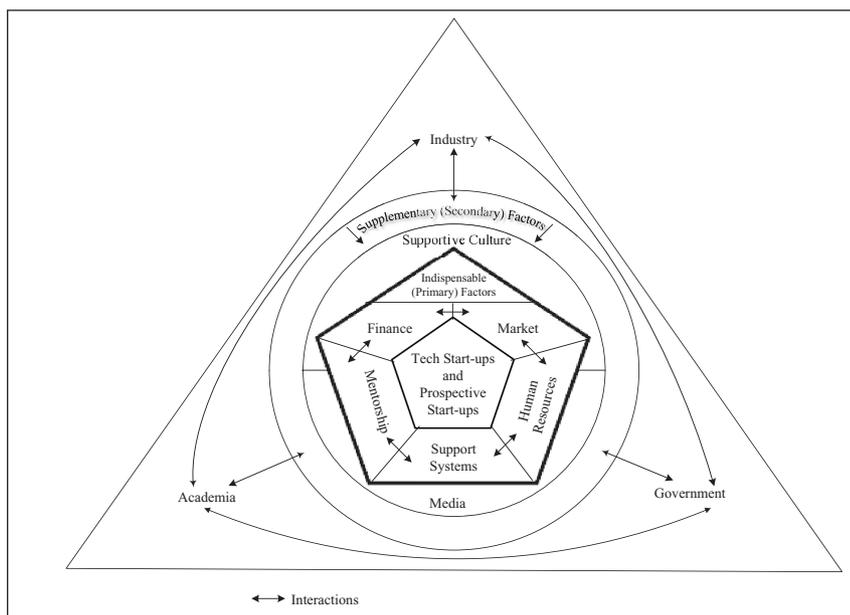
However, the challenge of developing an entrepreneurial ecosystem takes a different dimension, in a tier 2 city in an emerging economy, particularly when:

- (i) it is away from the regional government (G);
- (ii) it has no significant research base generated from the presence of research intensive public/private universities or public R&D institutions (A); and
- (iii) it has no significant presence of large scale industries, particularly MNCs (I).



Source: Bala Subrahmanya (2017a)

Figure 1: Entrepreneurial ecosystem for tech start-ups – core issues and supportive elements



Source: Bala Subrahmanya (2017a)

Figure 2: Entrepreneurial ecosystem for tech startups in India: structure and components

This is a situation where Triple Helix base is largely absent. How could an entrepreneurial ecosystem be promoted to nurture tech start-ups in such a region? Who has to take the initiative? What course of action is appropriate? How effective will be such an ecosystem, if at all, developed? Empirical literature has hardly addressed this research question, which is of relevance to all emerging economies, particularly India, in the current context. The present study is undertaken to address this research gap.

Objectives, scope and methodology

The present study has two research objectives:

- How could a private technological university initiate the building up of an entrepreneurial ecosystem in a region, which is bereft of a Triple Helix base?
- What are the key achievements of such an initiative, and what promise does it hold for the future?

The study is primarily confined to exploring the role played by KLE Technological University in developing a tech start-up ecosystem in Hubli, officially known as Hubballi, which is the second largest city (next to Bangalore) in Karnataka state. Hubli forms continuous urban area with the city of Dharwad. Hubli-Dharwad is the largest conurbation in the state after the capital city of the state, i.e., Bangalore, in terms of geographical coverage and population. Hubli is located in Dharwad district, which is situated in the western sector of the northern half of Karnataka State. The district encompasses an area of 4260 km² lying between the latitudinal parallels of 15°02' and 15°42' North and longitudes of 73°43' and 75°33' East. The most conspicuous contour lines of very high and very low areas of the district are located 500 and 700 metres above the mean sea level, respectively. The district is bound by Belgaum in the north, Haveri in the south, Gadag in the east and in the southwest by Uttara Kannada district (Census of India, 2014) (Figure 3). The twin cities of Hubli-Dharwad are located at a distance of around 420 km north-west of

Bangalore, the capital of Karnataka state and 550 km south-east of Mumbai.

The district has a moderate concentration of manufacturing industries spread over eight industrial areas, namely, (i) Belur Industrial Area, (ii) Rayapur Industrial Area, (iii) Tarihal Industrial Area, (iv) Lakkamanahalli Industrial Area, (v) Sattur Industrial Area, (vi) Gamanagatti Industrial Area, (vii) Gokul Industrial Area, and (viii) Mummi-gatti & Narendra Industrial Area (KIADB, 2017). The district has a total of about 19,000 industrial enterprises, of which 924 are registered industrial enterprises comprising six large and six medium enterprises, the remaining being small scale and micro enterprises (MSMED, 2017). It is important to note that not even a single foreign MNC operates out of Hubli-Dharwad, as of now.

In the recent years, several initiatives have been taken to promote IT industry in the region, both in terms of infrastructure and academia. The Government of Karnataka through Karnataka Electronics Development Corporation (KEONICS) is setting up an exclusive IT Park in Hubli (KEONICS, 2017). A Software Technology Park of India (STPI), set up by the Government of India, has been operational since May 2001, which has its own incubation

centre and currently 30 companies are under incubation there (STPI, 2017). Thus, a drive to facilitate the growth of IT industries in the city has been initiated.

Hubli-Dharwad is the educational hub of northern Karnataka. The twin-cities have four universities, namely, (i) Karnataka University, Dharwad, (ii) University of Agricultural Sciences, Dharwad, (iii) Karnataka State Law University, Hubli, and (iv) KLE Technological University, Hubli, the last being the youngest and the only private technological university in the region. In addition, an Indian Institute of Information Technology (IIIT), as an autonomous institute setup by Government of India (MHRD), Government of Karnataka and Industry Partners (represented by KEONICS) as a not-for-profit Public Private Partnership (N-PPP) Society, was established in 2015. This is intended to be a world-class Information Technology Institute with the objective of developing professional expertise and to address the increasing skill challenges of Indian IT industry (IIITD, 2017).

More recently, an Indian Institute of Technology (IIT), as an autonomous premier engineering and technology university under the Ministry of Human Resource Development, Government of India, was set up in Dharwad in July 2016 (IITD, 2017). Thus, both industry and

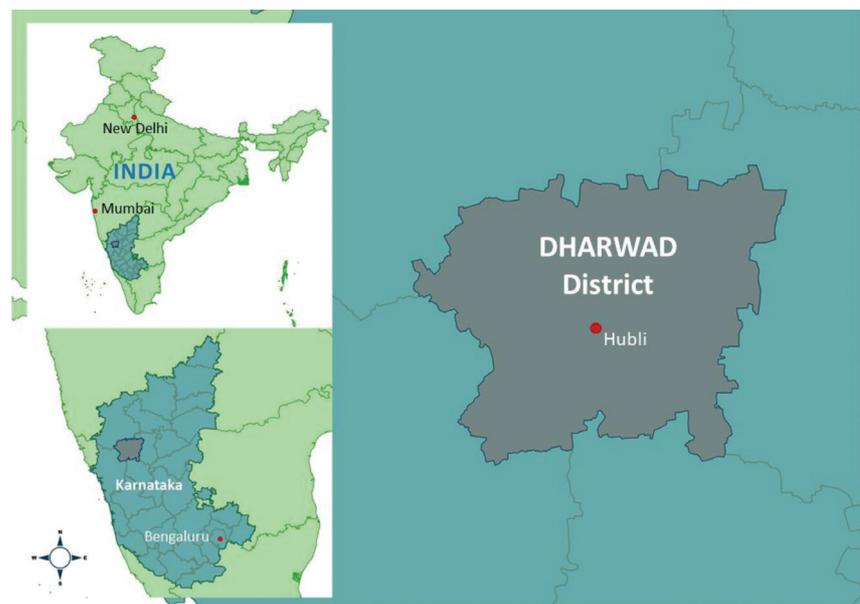


Figure 3: Dharwad district in Karnataka, India

academic institutions have yet to make a mark in the knowledge and technology intensive industries, on the map of Hubli-Dharwad twin cities, to attract any national attention.

Obviously, there was hardly any tech start-up that emerged and was operating out of Hubli about a decade back, and therefore, there was neither any venture capital fund nor any TBI or Accelerator or Co-working space based out of Hubli (as ascertained from multiple sources). The market base in terms of technology intensive industrial enterprises was absent and tech savvy consumers might have been very limited, to say the least. The engineering graduates, who emerged out of the engineering colleges in Hubli-Dharwad cities largely migrated to Bangalore and Mumbai in search of jobs. Given all this, the scope for the prevalence of business and technology mentors was practically nil. All these indicate the absence of a start-up conducive culture as well as a supportive media. This brings out that an ecosystem for tech start-ups [characterized by a Triple Helix base, with a nucleus surrounded by two outer layers consisting of five primary/ indispensable components and two secondary/supplementary components (as discussed earlier)] was non-existent in Hubli.

Given the above, a description on KLE Technological University (hereafter KLE-TU) is in order. The origin of KLE-TU can be traced back to 1947 when Karnataka Lingayat Education (KLE) Society, Belgaum established B V Bhoomaraddi College of Engineering and Technology with an aspiration of creating an institution that would lay the foundation of modern engineering education in northern region of Karnataka. Over the years, it evolved to reach and hold a unique position of pride in the technical education system of the state. According to one source, KLE TU was ranked 12th among all the engineering institutions in the State of Karnataka in 2016 (Career360, 2017). In pursuit of academic excellence, the BVB College attained academic autonomy from the University Grants Commission (UGC) in the year 2007, which enabled the institution to establish its distinctive character in the academic space through

its curriculum and student experience (KLE-TU, 2017).

In the ever-dynamic global economy, apart from delivering good quality education, the engineering institutions are expected to develop their capacity in research and innovation. They also need to undergo a fundamental transformation in terms of their role in the society, mode of operation, and economic structure and the scale at which they operate. To respond to these challenges, BVB College of Engineering and Technology undertook a strategic initiative of transforming itself into a University of national distinction. In 2014, BVB college was recognized as a state private University by the Government of Karnataka. Since then, it has embarked on several new initiatives towards nurturing entrepreneurship through promoting industry-institute interactions, on the one hand, and setting up a TBI, on the other (KLE-TU, 2017).

The case of KLE-TU in Hubli attracted our attention because recently we heard frequent references to KLE-TU in the Bangalore ecosystem for tech start-ups, due to (i) the former's noticeable performance in tech start-up generation, and (ii) migration of tech start-ups from Hubli in search of a larger market for stability and growth to Bangalore and elsewhere. Since we had previous interactions with KLE-TU through S V Patil, Professor and Head, Department of Management Studies, we approached him to obtain some preliminary information and to schedule personal interviews with the key personalities in KLE-TU and other relevant ecosystem stakeholders, on mutually convenient dates. Accordingly, based on the advice and help of S V Patil, authors scheduled a visit to Hubli on 29th and 30th May 2017.

To understand and analyze the role played by KLE-TU through the promotion of industry-institute interactions and establishment and operations of a TBI for promoting technology entrepreneurship led start-ups, we visited Hubli and carried out day-long intensive consultations and interactions on 29th and 30th May 2017, with the following:

i. Naveen Jha, CEO, Deshpande Centre for Social Entrepreneurship, KLE-TU;

- ii. C M Patil, Chief Executive, Sandbox Startups, Start-ups Incubation Centre;
- iii. Four start-ups which originated and operating out of Sandbox Startups;
- iv. Vivek Pawar, CEO, Sankalp Semi-Conductors;
- v. Nitin Kulkarni, Director, KLE Centre for Technological Innovation and Entrepreneurship (KLE-CTIE), KLE-TU;
- vi. Three tech start-ups, which originated and operating out of KLE-TU TBI; and
- vii. Ashok Shettar, Vice Chancellor and Professor, KLE-TU.

In addition, we scanned for, gathered and reviewed secondary data relating to general profiles, education institutions and industrial concentration of Hubli-Dharwad district as well as business news items published in print media on tech start-up initiatives in Hubli. This formed the basis for our case description, case analysis and discussion, inferences and conclusions.

The driving role of KLE-TU in creating an entrepreneurial ecosystem for tech start-ups in Hubli: A case study

If entrepreneurship has to increasingly blossom in a particular location, the prerequisites are: (i) presence of an adequate industrial ecosystem, (ii) visibility of the location, with adequate industrial infrastructure, and (iii) willingness of industrial enterprises, located elsewhere, to collaborate with local institutions. However, Hubli, as a location, did not have any of these, as recently as about a decade back. As a result, leave alone attracting entrepreneurship, even the engineering graduates who emerged out of KLE-TU migrated to large cities such as Bangalore and Mumbai, in search of employment opportunities. This hardly gave scope for the emergence of local entrepreneurship and thereby deprived nurturing of local competitiveness.

Therefore, the challenge facing KLE-TU was crystal clear: apart from playing the traditional roles of (i) human resource development through knowledge transfer, and (ii) knowledge generation through R&D, it had the responsibility of driving

regional economic and social development. With no significant presence of regional government (G) and large scale industries (I), to drive the Triple Helix base, as a representative of Academia (A), KLE-TU under the leadership of its Vice Chancellor, Ashok Shettar, decided to take the lead role in the beginning of the current decade.

However, in the absence of a clear role model visible in the context of Indian higher education institutions, KLE-TU looked up at the Massachusetts Institute of Technology (MIT) and its impact on the regional economy, as brought out by one of the reports of Kauffman Foundation. To foster, enable and grow the innovation and entrepreneurial ecosystem, KLE-TU founded Centre for Technology Innovation & Entrepreneurship (KLE - CTiE), informally in February 2012. It got official recognition from the Department of Science and Technology, Government of India, New Delhi in February 2016. KLE - CTiE adopted a two-pronged strategy to build an entrepreneurial ecosystem, to (i) attract and support external entrepreneurs, and (ii) inspire, educate and enable student start-ups. Let us first examine how were the external entrepreneurs attracted and supported to emerge from Hubli.

Developing external support for the ecosystem

Deshpande Foundation India

The roping in of Deshpande Foundation of Gururaj Deshpande and Jaishree Deshpande (who hail from Hubli but attained global reputation through their outstanding professional achievements in the IT industry in the USA) as an external supporter for entrepreneurship promotion by KLE-TU was one of the first major steps taken by KLE-TU. Gururaj, an alumnus of IIT Madras, was the Co-chair of a National Council to support US President Barack Obama's innovation and entrepreneurship strategy. He has set up Deshpande Centre for Technological Innovation at Massachusetts Institute of Technology (MIT), USA, among others. He has pursued an entrepreneurial career for the last three decades. He is involved either as the founder, a founding investor or chairman

of several companies including Cascade Communications, Sycamore Networks, Coral Networks, Tejas Networks, Cimaron, Webdialogs, Airvana, Sandstone Capital, A123 Systems and Curata (Deshpande Foundation, 2017).

Gururaj Deshpande and Jaishree Deshpande have encouraged the use of entrepreneurship and innovation as catalysts for sustainable change in the United States, India and Canada since 1996. The Deshpande Foundation India was established in 1996, as a part of the global philanthropic pursuits of Deshpande Foundation, which launched Hubballi Sandbox in 2007. "The aim of the Sandbox is to create an environment where unconventional approaches to addressing social innovation is encouraged. The value of the Sandbox lies in its ability to identify synergies and explore potential collaborations among the catalyst network" (Deshpande Foundation, 2017). Applying a 'bottom-up' approach to build scalable solutions, the Deshpande Foundation India - Hubli Sandbox works to create an effective ecosystem where resources are put to use through entrepreneurship, innovation and sustainability. The Hubli Sandbox engages with not-for-profits, academics, organizations and entrepreneurs leading to the launch of effective and scalable models of development.

It has adopted three distinct approaches for the creation of entrepreneurship and start-ups, namely:

- (i) Sandbox Action Partnerships;
- (ii) Inculcating Leadership among Communities; and
- (iii) Building Entrepreneurs through Education and Mentorship.

KLE-TU invited Deshpande Foundation and enabled the location of the Deshpande Centre for Social Entrepreneurship inside the University campus in 2012. In line with the spirit of the Deshpande Centre at MIT, USA, the Centre at KLE-TU has the mission of funding technology products for commercialization. This is achieved, in two ways:

- Prospective entrepreneurs for incubation are short-listed based on their ability to conceptualize the ideas and the identification of target markets. In addition, the background of promoters and team composition played a crucial role.
- The short-listed prospective start-up funders are invited to visit Deshpande Centre to make a presentation and for an interaction. The final selection of prospective start-ups is made based on their suitability and ability to get accommodated in the TBI ecosystem.

Facilitated the location of large scale Private Enterprises in-house

KLE-TU felt the need for the location of private enterprises within the campus. Accordingly, it facilitated the in-campus birth and growth of four private enterprises, namely, (i) Sankalp Semi-conductors (hereafter SS), (ii) Navya Biologicals, (iii) Athena composites, (iv) Hi-Wi Communication (GDV), by creating the right value propositions in terms of (i) providing working space, (ii) support facilities, and (iii) start-up - student/faculty synergy. The objective was to have anchor entrepreneurs on the campus who can develop synergy with the faculty and students for mutual advantage.

Of the four, a reference to the birth and growth of SS in KLE-TU is in order. SS is an advanced technology services provider offering comprehensive solutions from concept to prototype, in the semiconductor space. It offers an integrated portfolio of services to their clients in key domains including digital, analog, high speed physical interface IP, Embedded Memory Compiler and EDA modelling (Sankalp Semiconductors, 2017). The CEO of SS, Vivek Pawar was an employee of Texas Instruments (TI) in Bangalore. He was subsequently shifted to Houston, USA. But, Vivek always felt the need to do something for his country, by generating entrepreneurship and providing employment to the local youths and prevent brain drain to metropolitan cities in a technologically less developed Tier-2 city.

Though Vivek created his enterprise (SS) in Bangalore, he got business from TI

based in Houston. As his objective was to move into a Tier-2 city, he had the option of shifting SS to one of the three cities in Karnataka state, namely, Mysore, Belgaum and Hubli. The prompt positive response that he received for his query from KLE-TU led him to Hubli and understand the efforts put in by KLE-TU for entrepreneurship promotion and ecosystem building. The offer of space, free of cost, by the Vice-Chancellor of KLE-TU to Vivek clinched the issue in favour of creating another unit of SS in Hubli, apart from Bangalore. He founded Hubli-based SS in 2005. Today, SS employs about 1000 persons (mostly rural youths) and operates out of six locations, namely, Bangalore, Kolkata and Hubli in India, apart from Canada, Germany and USA. His only intent was to create centres in Tier II cities of India, in order to enable *inclusive growth*, and SS is a small step towards that (Yourstory, 2016).

Partnering with NETRA

NETRA is the acronym for National ESDM Technology Research Academy, which is a consortium and think tank supported by India Electronics and Semiconductor Association (IESA) and Electronics Sector Skills Council of India (ESSCI) which includes, among others, the Vice Chancellor of KLE-TU. The vision of NETRA & ESSCI is to transform engineering campuses into ESDM Product Innovation Centers [EPIC] through Industry Partnerships. The key promoters of NETRA envisioned to integrate the right ingredients to drive the global leadership from India in a high-technology sector such as ESDM.

To achieve their vision, the key stakeholders of NETRA derived a plan to focus on research with productized solutions. This plan was arrived at after a careful review of the operating models of successful global entrepreneurial ecosystems across the world – such as Stanford University, USA, Industrial Technology Research Institute (ITRI), Taiwan Province of China, Electronics and Telecommunications Research Institute (ETRI), Republic of Korea and International Medical Equipment Collaborative (IMEC) in Europe. Technology research where the right problems were chosen by industry trained faculty, incuba-

tion of new product ideas derived out of the technology research, capacity building of faculty and students as a result of the previous activities leading to development of an indigenous chip from India as a high-tech product formed the key tenets of the implementation roadmap of the proposed plan. Though IESA aimed at promoting six ESDM Centres of Excellence (ECOE) in six different locations of India, only KLE-TU could establish the centre. The students, faculty, resident entrepreneurs, the support system at KLE-TU served as the key ingredients required to enable success of the pilot program to build an indigenous IOT chip out of the activities pursued as part of this consortium (IESA, 2016).

As of now, the first India Chip built from the above efforts is being tested. About 90% of the students involved in this activity were successfully absorbed to lateral positions in different MNCs – indicating the success in capacity building and skill development in the sector. The flexibility provided by KLE-TU to consider Industry course as a credit course enabled the incubation, research and product development activities of this plan. In summary, by being a core partner in the NETRA program, KLE-TU is providing the foundation for further success in the high-tech entrepreneurship sector.

Building internal ecosystem

What was equally challenging was the creation of an internal system to nurture entrepreneurial talent within KLE-TU. To achieve the objective, CTIE planned both formal and informal interventions with the graduate student community (ranging from the first year till the final year of engineering). The interventions are aimed at (i) inspiring, and (ii) educating & enabling student start-ups.

The informal intervention has three stages of operations:

Pupa → Ideation Camp → Butterfly
→ Capstone Project Track

Pupa: The objective of Pupa is to capture ideas from the young minds for its subsequent nurturing. Pupa is an annual programme conducted by and at KLE-TU for the engineering graduate students belonging to various engineering education institutions across the state and

beyond. Pupa was initiated in 2013. Since then, it has been attracting more and more students, year by year, where student groups exhibit their ideas for evaluation. In 2016 alone, 1250 students from 30 institutions participated in the Pupa where 404 teams exhibited their ideas.

Ideation camp: The ideation camp is a two-day workshop (with 72 seats) where students are trained for idea validation, and pitching. This will have multi-disciplinary teams and it is result oriented. Ideation camp was initially launched by *Intel* as a Youth Enterprise Programme, which was started by KLE-TU in 2014. As of now, Ideation Camp is primarily confined to KLE-TU students.

Butterfly contest: The KLE-TU students with proven ideas are encouraged to move on to the Butterfly stage involving technology business plan contest, which has an overall duration of three weeks. The business plan contest is judged by industry partners of KLE-TU. The successful ones graduate to join Capstone Project Track of CTIE in the final year of their engineering degree programme. The Butterfly contest was first launched in 2012 as a lead into the Capstone Project Track with seven projects comprising 37 students successfully joining the track (out of a total of 14 teams involving 52 students altogether).

The formal intervention is done through planned curriculum introduction as follows:

Engineering design → Product design and realization → Principles of innovation & entrepreneurship → Capstone Project Track

An engineering design course has been introduced across all the disciplines of engineering and it ends with a design project. This enables the students to get a grasp over project designing. This is generally done in the second semester. In the third and fourth semesters, the students are formed into multi-disciplinary teams for enabling them to understand product design and realization, with hands on projects. This is done with respect to existing technology products.

Subsequently, these students have to credit a course on principles of innovation and entrepreneurship, to get exposure to

business development. In addition, they are trained in business communication and other soft skills. They are also exposed to Massive Open Online Course (MOOC) and field work. This was initially confined to the freely available University of Maryland (USA) online course, but recently this has been replaced by "Start-Up India Programme" inputs.

Finally, they enter into Capstone Project Track with their final year projects. Capstone Project Track is held for the final year students spanning over the last two semesters of their engineering degree programmes. Here they are trained in conceptualizing and developing their innovative ideas which have a commercial potential, and after graduation, opportunities are given for such students to get into formal business incubation.

It is important to note that both informal interventions and formal interventions converge at the Capstone Project Track, which is the stepping stone for technology entrepreneurship emergence in the form of tech start-ups.

Major achievements: Developing industry-academia linkages for start-ups

The CTiE of KLE-TU has come a long way since its inception. The key achievements are as follows:

- CTiE currently has 38 start-ups, nearly $\frac{3}{4}$ of them are from serial entrepreneurs.
- These start-ups have engaged more than 450 students through internships and projects, indicating the growing enterprise-student synergy.
- In four of the start-ups, faculty members of KLE-TU have joined as co-promoters and/or co-innovators, implying enterprise-faculty synergy.
- These start-ups have created more than 400 engineering jobs for the local graduates and thereby prevented their out-migration from Hubli in search of employment.
- The products from start-ups such as LabinApp, Navya Biologicals, Krishagni, GDV Research are exported all over the world, which indicate their international acceptability.

- Some of the start-ups work on smart drones, block chain technology, bio-medicines and bio-materials, among others, which reflect on the technology intensity of the projects involved.
- During 2014-2016, CTiE has led to the emergence and operations of 11 student led start-ups. Thus, encouragement to student entrepreneurship has started bearing fruits.
- Eight of the 38 start-ups, which have already started their revenue generation stream, has moved into KLE-CTiE Tech park in January 2017 on commercial terms thus providing revenue for KLE-CTiE. This is a win-win situation for both start-ups and the incubator.
- Two of the enterprises which emerged as start-ups, namely, Sankalp Semiconductors and Navya Biologicals have grown to become Rs.1000 million+ turnover companies. This indicates their success and growth in terms of scaling up.
- Growing media attention towards Hubli and slow and steady building up of the culture of entrepreneurship, thanks to the diverse initiatives of KLE-TU and its outcomes.

Overall, KLE-TU through CTiE has primarily aimed at encouraging the building up of ecosystem components with the help of industry, by directly encouraging industrial enterprises/start-ups to emerge within the university campus, and enabling them to develop synergy with both faculty and students, for mutual advantage. This is achieved by providing the following to in-house enterprises:

1. Physical space;
2. Access to the facilities on campus;
3. Student and faculty partnerships;
4. Business and Technology mentoring (in case of matching skills being available on campus);
5. Business plan reviews and potential pivots; and
6. Professional business environment.

At the same time, with a clear definition of formal and informal interventions, CTiE has developed a road map for the emergence of student entrepreneurship for technology start-ups. In the whole

process, CTiE has achieved a considerable degree of success in developing a bare minimum entrepreneurial ecosystem in Hubli comprising the following:

1. A Double Helix base bringing together Academia and Industry, in the absence of explicit role of the Government;
2. A growing number of tech start-ups and prospective tech start-ups;
3. Five indispensable components consisting of (i) finance, (ii) market, (iii) human resources, (iv) support system involving business incubation and support services, and (v) business and technology mentors;
4. Two supplementary components, namely, (i) supportive culture, and (ii) supportive media.

This entrepreneurial ecosystem, though at its infancy, is able to produce results in the form of growing number of start-up emergence leading to their stability and sustenance, and even success and growth, but on a very limited scale.

Inferences and conclusions

KLE-TU has played a commendable role towards creating an entrepreneurial ecosystem for tech start-ups in Hubli, in the absence of an explicit Triple Helix base. As an academic institution, it found the local presence of private large enterprises imperative, to prevent the exodus of engineering graduates out of the city, in the short-run, and as a means of generating different components of an entrepreneurial ecosystem, in the medium to long run, apart from generating technology entrepreneurship itself. The entry/growth of private large enterprises in the field of IT industry was a challenge because earlier attempts to rope in domestically grown IT MNC, Tata Consultancy Services (TCS), followed by Bangalore-based Quest, an engineering services IT company, into Hubli had ended up in failure, due to the inordinate delay in the decision-making process of the regional government in allotting the required land (Times of India, 2006).

Thus, in the absence of a conducive and explicit support of the regional government for the entry and/or birth and growth

of domestic large-scale IT enterprises in Hubli, apart from the absence of any MNC and any major research oriented public educational institution till recently, it was left to the only reputed engineering education institution, KLE-TU in the region “to act or to leave it”. The leadership of KLE-TU took the plunge by taking appropriate initiatives towards the building up of an entrepreneurial ecosystem for nurturing tech start-ups. It rightly focused on encouraging large scale high-tech private enterprises, in the absence of any major public-sector enterprise in the region. It has made the right judgement by promoting the birth and growth of private large-scale enterprises within the university campus, to forge links with the faculty and students, for learning as much as for generating employment and thereby prevent out-migration of young technical talent from the city. Though the achievement made thus far is only on a tiny scale, it is a heartening beginning.

The fact that Gururaj Deshpande who hails from Hubli, but more importantly well-disposed to the city to contribute to the development of IT industry and entrepreneurship, became handy for KLE-TU to seek his contribution to the ecosystem development initiatives. By arranging talks from him in the University during his annual visits to Hubli, KLE-TU is deriving benefits out of his international experience and exposure as an entrepreneur and venture capitalist, for strengthening Hubli ecosystem. The setting up of Deshpande business incubator and its entry into KLE-TU added further strength to the external environment of the university. However, KLE-TU rightly observed that mere development of external support will not carry it any far. What is equally important is to build an internal environment for the creation of entrepreneurship. It is here that the two-pronged strategy in terms of informal and formal initiatives for entrepreneurship development adopted by KLE-TU needs to be appreciated. Even here the University has made a beginning, though on a modest scale, not only by forging links with the large scale private enterprises (located within the campus as well as outside) by providing quality technical talent, but more importantly by generating technology entrepreneurship.

Thus, the KLE-TU initiatives, on the one hand, tried to make up for the absence of a strong “Triple Helix” base, and on the other, contributed to the creation of the much needed “nucleus” of tech start-ups (and prospective tech start-ups), and one of the important indispensable (primary) components, namely, human resources. The involvement of University faculty in the nurturing of tech start-ups in the proof of concept/prototype development and a Minimum Viable Product (MVP), led to a gradual emergence of “technical mentors”. In addition, the forging of successful links with private enterprises enabled the provision of “business mentors” to tech start-ups, for “market” identification, locally, regionally and even internationally. As majority of the “fledgling start-ups” were primarily looking for “finance” in the form of seed funds, they were arranged internally either by the start-up founders themselves or by the TBIs, including CTIE of KLE-TU.

The emergence of tech start-ups and their operations, thanks to the role of Deshpande Foundation, particularly Deshpande Centre for Social Entrepreneurship and CTIE of KLE-TU, the favourable “entrepreneurial culture” is slowly and steadily blossoming. This has started attracting the attention of local and regional “media”. Further, by opening up its student entrepreneurial programs to all other universities and colleges around the region, KLE-TU is building strong networks and awareness about technology entrepreneurship which will be conducive to enhance the entrepreneurial culture of the region, thereby also generating positive media coverage for its activities. Thus, slowly and steadily two supplementary (secondary) components are also emerging in Hubli.

This is how, KLE-TU ensured the bare minimum - emergence, presence and availability - of tech entrepreneurial ecosystem components: acting single handedly for a Triple Helix base, and thereby generate a nucleus and five indispensable components, followed by two supplementary components. To sum up, KLE-TU has enabled Hubli to make a beginning on the path of a suitable entrepreneurial ecosystem development for tech start-ups, but it has a long way to go to make a mark on the start-up ecosystem landscape of India. Particularly, its

task of building on the gains already made will be more challenging in the future.

Bangalore, being a globally recognized tech start-up hub with heterogeneous high-tech clusters, involving a strong Triple Helix base, a growing number of tech start-ups and prospective tech start-ups, apart from the other valuable ecosystem components, is still considered to be “evolving”, implying that it is still moderately matured (Bala Subrahmanya, 2017c). As of now, Hubli still lacks a strong base of R&D institutions and MNCs, particularly Fortune 500 companies in the IT sector, both of which are diverse sources of tech entrepreneurship, human resources, early market adopters, technology and business mentorship, sometimes even finance and support system in the form of TBIs/Accelerators. Unless and until (i) KLE-TU networks with the “recently born” IIITD and IITD, and (ii) regional government takes an initiative for attracting IT MNCs into Hubli, further growth of the ecosystem can be hardly achieved to ensure an increasing number of birth as well as growth of tech start-ups in the future. To conclude, ensuring the presence of a fairly strong Triple Helix base as early as possible is the need of the hour for KLE-TU as much as for Hubli if it has to make it big in the future.

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