

Nurturing Technology and Innovation for Sustained Growth: Role of Universities

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Original Research

Received 22 Sep 2022

Revised 25 Dec 2022

Accepted 26 Dec 2022

*Additional information at the end
of the article*

Abstract: At a theoretical level, the triple helix model has been developed and understood by scholars for the last two decades. The interdependence and the interplay among the government – academia-industry, both at a theoretical as well as empirical level is well established. Researchers have focused on different stages of the triple helix model, wherein the first stage is denoted as the statist model. This paper tries to understand and express the application of the Triple Helix Model in the case of T-Hub, an incubator in India and its success due to its interplay with universities. An embedded single case study approach has been used to understand the interaction between local government, academic institutions, and the industry. The case shows the strategic application of the Triple Helix Model for encouraging entrepreneurial activity at Hyderabad by the Government of Telangana for optimum results by bringing together universities, industry, and the state apparatus.

Keywords: Triple-Helix; universities; technology; entrepreneurship; innovation; T-Hub

Abstrak: Pada tataran teoritis, model *triple helix* telah dikembangkan dan dipahami oleh para akademisi selama dua dekade terakhir. Saling ketergantungan dan interaksi antara pemerintah – akademisi-industri, baik pada tingkat teoritis maupun empiris sudah mapan. Para peneliti telah berfokus pada berbagai tahapan model *triple helix*, dimana tahap pertama dilambangkan sebagai model statistik. Penelitian ini mencoba untuk memahami dan mengungkapkan penerapan Model Triple Helix dalam kasus T-Hub, perusahaan rintisan di India dan keberhasilannya karena interaksinya dengan universitas. Pendekatan studi kasus digunakan untuk memahami interaksi antara pemerintah daerah, lembaga akademik, dan industri. Kasus tersebut menunjukkan penerapan strategis Model Triple Helix untuk mendorong aktivitas kewirausahaan di Hyderabad oleh pemerintah Telangana untuk hasil optimal dengan menyatukan universitas, industri, dan aparatur negara.

Kata Kunci: Triple-Helix; universitas; teknologi; kewirausahaan; inovasi; T-Hub

INTRODUCTION

The relationship between technology and innovation-driven entrepreneurial culture resulting in the sustained growth of any country or state is well established (Audretsch et al., 2006; Brännback et al., 2008). It has also been observed time and again that governments have instituted conducive policies towards the achievement of such outcomes. Such growth would boost entrepreneurial activity, add to the overall productivity, and create employment for the people of the state (Kelley, Singer & Herrington, 2012). It is established that one of the ways this can be achieved through the Triple Helix model of collaboration (Etzkowitz & Klofsten, 2005; Etzkowitz & Leydesdorff, 2000). The model brings together the three most important actors, including policymakers, both at the national as well as regional level, universities and firms and examines their collaborative role in developing a robust technology and innovation system for sustained growth (Leydesdorff & Etzkowitz, 1998; Leydesdorff et al., 2017). Subsequently, substantial numbers of researchers have conducted studies around this theme to gain a deeper understanding of the realms of interactions between the actors (Asheim & Coenen, 2005; Asheim et al., 2007). With an increase in such collaboration between the actors, the triple helix model has

garnered a lot of research interest from academicians as well as practitioners interested in examining its impact at a global, national or even at a regional level.

The focal points of research on the schematics of the triple helix model have been the western world. However, in recent times, the focus is shifting towards Asia as it is emerging as a hub of innovation and entrepreneurial ventures with several transitional economies (Cai, 2014; Cai & Liu, 2014). Researchers, in this area, have focused primarily in developing an understanding of the model, in theorizing and critically evaluating the same. Thus, scholars have not yet trained their attention towards the steps taken as well as practices adopted by the actors of the model in deriving the results that the model has theorized.

This paper aims to develop an understanding of the organizational practices of actors and impact the desired outcome of triple helix model of innovation. In this paper, the author shall try to bring to the fore the importance of organizational practices and the importance of the linkages established between the actors that results in achieving success in the implementation of the triple helix model as there exists no directive or research finding that can serve as a guide to regions or nations that might be inclined towards adopting as well as adapting to the model.

The first part of the paper discusses, the background of the case followed by the section on the conceptualization of the triple helix model, its origin & evolutionary theories including barriers of implementation of the model in reality. The next section focuses on the selection and role of the actors, followed by a section that explores the generation of the idea. In the following section, the authors discuss the outcome of the implementation of the concept, and the last section discusses, the learning and possible applications of the triple helix model.

LITERATURE REVIEW

The Triple Helix Model: A Conceptualization

Origin of the Concept

Conceptualized in the 1960s, the triple helix model (Etzkowitz and De Mello, 2004) was introduced by Julius as a concept called “triangle” and defined as “where all those responsible, in one way or another, for the all-important economic development of their countries rack their brains to find the balance within the many complicated relationships in the modern eternal triangle of government, industry and science” (Ciapuscio, 1994).

Building on the concept of this “triangle,” Sábato and Botana (1968) proposed that it was essential for the society to establish dynamic interactions of science and technology among its three vertices for the progress through innovations. The three vertices of society mentioned in Sábato’s famous triangle model were: “government (G); the productive structure (E) including private and government-owned companies; and the science-technology infrastructure (I), including universities, public and private R&D centres.” Sábato and Botana (1968) argued that “the model not only aimed at being an analytical instrument that represented reality but also demonstrated that the mere existence of the triangle ensured the rational capacity of a society to know where and how to innovate.”

Etzkowitz and Leydesdorff (1995) advanced the concept and coined the term “Triple Helix model of innovation.” Etzkowitz and Leydesdorff (1997) defined the Triple Helix model as a “*spiral model of innovation, which is able to capture multiple reciprocal linkages at different stages of the capitalization of the knowledge.*” The Triple Helix model is the “key strategy of the national or multinational innovation agenda of the 21st century.” Godin and Gingras (2000) found a positive relationship between the vertices in their study in Canada, thereby, supporting the work of Etzkowitz and Leydesdorff (1997).

Theoretical Framework of the Triple Helix Model

The triple helix model focuses on continued learning and finding solutions to problems from such learning (Leydesdorff, 2012). According to Leydesdorff (2012), the model accommodates an intricate interplay between academic institutions, the government, and the industry to comprehend issues in between themselves, while attaining knowledge through the exchange of their unique experiences. Some researchers (e.g., Clark, 1998) insisted that one may concentrate on the interactions and interrelations between any two actors of the Triple Helix model, such as university-industry or industry-government

or government-university. However, Leydesdorff (2012) emphasized that in such cases, the third actor of the triple helix model must be recognized as an “additional source of variation”.

Etzkowitz (2003, 2008) argued that over time, the model has evolved and during the process of evolution benefitted several nations by enabling maximization of the synergies among the three actors and formed the essential part of innovational growth. The transition originated from two positions that are opposite of each other: “a statist model of government controlling academia and industry, and a laissez-faire model, with industry, academia, and government separate and apart from each other, interacting only modestly across strong boundaries” (Etzkowitz, 2003). According to Etzkowitz, the statist model proposed that in the interaction between the academia, industry and the government, the government played a prominent role in driving, controlling and organizing innovation rather than being an equal partner in curating an innovation driven ecosystem. As proposed by the Laissez-Faire model, each of the three function autonomously. The industry is perceived to comprise of independent firms competing among each other on the fabric of the market, the government’s role is directed towards managing market failures and the academia focuses on pushing the boundaries of knowledge through teaching and research. Furthering these two models, Etzkowitz and Klofsten (2005) proposed a hybrid model. In this model, according to Zheng and Hu (2018), academic institutions and universities were considered at par with the government and the industry. The model envisions a co-created cohesive ecosystem among the three rather than any one of them leading and the others are following.

RESEARCH METHODOLOGY

With an aim to explore the phenomenon of triple helix actor interaction and also to understand the importance of networks, the authors opted to use the case study method as a case study can illustrate an in-depth complex phenomenon embedded in real-life (Eisenhardt, 1989). Methodologically, a single embedded case study design approach is used as the T-Hub can be seen as an extreme or unique case (Yin, 2017) of triple helix collaboration, where three leading academic institutions of India along with the industry actors and government have come together for furthering the cause of innovation for prospective economic growth. Since this paper seeks to understand the interaction between actors, it uses an embedded case study approach as it involves more than one sub-unit of analysis, allowing a broader focus of the case (Thomas, 2011).

Data Collection

For the purpose of this study, specific protocols for data collection were developed to strengthen reliability and validity. The data collection method involved (a) conducting semi-structured interviews with the top officials of the T-Hub, office holders from the government departments, academic institutions, and founders of the ventures incubated at the T-Hub, (b) maintaining personal notes prepared during meetings, (c) collating publicly available data related to all the actors, and (d) accessing press notes and releases documenting the success of T-Hub. The four-criteria rule proposed by Lincoln and Guba (1985) was followed wherein credibility was ensured through prolonged engagement between the researchers and the participants. Data collection was completed over a span of sixteen months with several rounds of discussions preceding and following each setting of structured interviews. Further, researchers undertook method, source, and analyst triangulation. For analyst triangulation, data analysis was undertaken based on the coding technique suggested by Glaser and Strauss (1967) for the extraction of the main concepts. Codes were generated by line-by-line coding followed by a comparison of the open codes between the authors to arrive at a mutually acceptable conclusion.

To ensure transferability, a thick description in the form of quotes made by the Entrepreneurs and Venture Capitalists (VCs) was collected and analysed by the authors, which further illuminated the settings and context. Thick description can, hence, position the reader to (if deemed applicable) aptly transfer such findings to the context. Dependability was ensured by maintaining an accessible data audit trail. A detailed trail of the entire process of collection of data, analysis of the same, the first set of contact details and the methods of contact including the snowball sampling technique to obtain access to the entrepreneurs and VCs was maintained. Conformability was ensured by maintaining a reflexive journal and notes taken during interviews, audio recordings and transcriptions.

Case Background

Telangana was formed in the year 2014 and became the twenty ninth state of India with Hyderabad as its capital. The state, under the leadership of its Chief Minister, adopted disruptive strategies for evolving effective policies with regard to societal development. Just like any other government, one of the significant areas of focus for the Telangana Government was the economic engagement of the public. Intense meetings among stakeholders, consultations with various social agencies, and several high-level meetings within the government departments resulted in the mission to make Hyderabad, one of the most favored destinations for startups and to bring about a sustainable entrepreneurial culture (Subrahmanyam, 2017). This decision was backed by top leadership support and a viable strategy. The Government explored the possibility of introducing the triple helix model of interlinking academia – industry-government for the desired outcomes (Pattnaik & Pandey, 2014).

Hyderabad had had its tryst with entrepreneurial activity earlier also. It was a prosperous and industrially active state even while it was ruled by the Nizams. Industry had flourished and so had institutions of higher learning and universities. It was considered one of the most progressive states of the British controlled India. The princely state of Hyderabad became a part of India in 1948. As the process of integrating Hyderabad into the country began, the government brought in several policy-level interventions. As a result, public sector industries were set up and industrial estates were established for the small and medium enterprises to take root. On the other hand, the government founded several research and development centers to foster the scientific spirit. Several public, as well as private educational institutions were also set up.

Since the 1980s, the industrial activity in Hyderabad was primarily concentrated in the area of pharmaceuticals and biotechnology (Saberwal, 2006). Both placed innovation at the center of their existence to be competitive both nationally and globally and, thus, embedded in themselves a high acceptance for innovative practices in the way they conducted business. However, the major boost to technology-led innovative companies came in the 1990s (Grondeau, 2007). The local (regional) Government, through explicit policy interventions, took an active interest in transforming Hyderabad into a service-driven knowledge society. Through the provision of cost-effective quality-conscious services, Hyderabad leapfrogged from a manufacturing to a knowledge-based society.

Hyderabad became a hub of information technology-enabled services from the year 2000 onwards, housing several technology companies ranging from small and local to large multinationals. With the proliferation of technology companies, Hyderabad experienced a new outlook towards technology and technological know-how (Das, 2015). There were instances of need-based partnership between multinational and local companies. Hyderabad also has a substantial number of public research institutes in areas of defense, pharmaceuticals, biotechnology, manufacturing etc. and leads in both fundamental as well as applied research in several of the mentioned areas (Chacko, 2007). Similarly, with universities and technical institutes of eminence undertaking education and research activities, Hyderabad has a substantial number of students undergoing training in research with commercialization potential. Hyderabad is house to six universities and Institutions of National Importance (including the Indian Institute of Technology (IIT), All India Institute of Medical Sciences (AIIMS), International Institute of Information Technology (IIIT), NALSAR University of Law (NALSAR), Indian School of Business (ISB), etc.), thirty-two Scientific and Research Institutes along with hundred and eighty-five registered in-house research centers operated by private industry.

In effect, Hyderabad had all the components of the triple helix in place. Research-led technology creators, the industry as technology drivers, and the human capital as technology users. The Government was interested in leveraging this while taking Hyderabad to the global map of entrepreneurial activity. The state government had the intent, ability, and vision to connect the actors of the triple helix model (government – academia-industry) to formulate and achieve the desired outcomes. Similar to Hyderabad, another South Indian city, Bangalore is often credited as one of the most rapidly growing IT clusters in the world with well documented links with the Silicon Valley (Sonderegger & Taube, 2010). However, when it comes to ease of doing business, Hyderabad, the capital of Telangana state, consistently topped the charts. Some relaxation in terms of legal, disclosure and financial policies have also aided the startup ecosystem in Hyderabad. These include allowing startups to pay State Goods and Services Tax (SGST) and later avail yearly reimbursements. In addition to this, the state government also allowed 100 percent stamp duty reimbursement for the startups. This shows that the government

wanted to play a central role displaying what Etzkowitz and Leydesdorff (2000) have referred to as the “statist” model.

Identifying the Actors

The state decided to encourage technology and innovation-based entrepreneurship among the populace. The government, through its Information Technology, Electronics and Communications (ITEC) department, attempted to identify the central actors that could play a major role in designing the model. As a first step, the ITEC began deliberations with several institutes, research & development centers, and industry leaders. Over a year, it developed parameters of selection for academic institutes, research & development centers, as well as for the industry. With regards to the academic institutes, the focus was on their domain specialization, number of full – time faculty, reputation, public access, number of students, and entrepreneurship embedded curricula. Upon rigorous analysis, the ITEC decided to engage with the 3 top domain-specific academic institutes in Hyderabad namely the IIIT, ISB and NALSAR.

Established in 1998, IIIT, Hyderabad is an information technology research university and first autonomous public private institute with an aim to advance research and innovation in areas of computer science, electronics and communication. IIIT Hyderabad also offers MSIT program in collaboration with Carnegie Mellon University, USA. The institute lays high importance on “Human Values” and professional ethics. In terms of ranking, it was ranked as the seventy eighth among all institutes of higher learning in India by the National Institutional Ranking Framework (NIRF) in 2020 and among the top four hundred in the QS World University Rankings for the same year. With a vision of commercializing technology developed in its research centres, IIIT Hyderabad started supporting startups since 2008. Subsequently in 2012, Government of India recognized the incubation facility as a Technology Business Incubator. The Centre for Innovation and Entrepreneurship at IIIT Hyderabad is the largest educational technology incubators in India. Over the years it has supported two hundred plus startups. With about two thousand five hundred students, more than hundred full-time faculty members and an active Centre for Innovation and Entrepreneurship, it was a conscious choice.

Established in 1998, NALSAR is among the best destinations to pursue legal education in India. It has been consistently ranked among the top choices by many ranking agencies including being conferred the prestigious A++ rating by the National Assessment and Accreditation Council of India. NALSAR offers a five-year integrated B. A LL.B. (Hons.), one-year postgraduate LL.M., two-year master’s degree in Business Laws and Administration (MBLA), one-year Master of Philosophy (M.Phil.), two-year MBA program and Doctoral studies. It also offers few unique and innovative programs in Aviation, Space, Telecommunications, GIS, and Remote Sensing to cater to the unprecedented growth and commercialization of the Aviation, Space, and Telecom sectors. With state-of-the-art infrastructure and fifty full-time faculty members, NALSAR had an enrolment of approximately two thousand students. The MBA program, through its curricula, had embedded entrepreneurial education in sync with legal learning.

ISB is a private business school that came into being in 1996 as a result of a collaborative effort between industry leaders and academicians par excellence. Powered by the desire to impart industry relevant and theoretically grounded education, its co-founders Rajat Gupta and Anil Kumar brought in all their experience of working at McKinsey and Company to prepare a master plan. It was ably supported by top ranked global business schools like Kelloggs to provide quality learning. It is accredited by the Association to Advance Collegiate Schools of Business (AACSB) and ranked among the top institutes in the world by agencies like the Financial Times and QS Global. It has an intake of approximately two thousand in its programs including the MBA, Executive – MBA, several other one-year Diploma courses etc. With world-class faculty recruited nationally as well as internationally, ISB has some of the most decorated faculty among all business schools in India. It also has a vibrant entrepreneurial culture. ISB is engaged in mentoring and incubating startups since 2015 through DLabs, it's virtual startup incubation and acceleration arm. Over fifty startups have graduated from ISB’s incubator. It also runs twelve theme-based accelerator programs.

After securing the support from the academic institutions, the ITEC department focused on harnessing the support of the industry in Hyderabad. It identified several leading corporate houses, including Cyient Technologies, Google, Microsoft, Tech Mahindra, etc. to play an important role in nurturing technology-based innovation for enhancing entrepreneurship in Hyderabad. Headquartered in

Hyderabad, Cyient Technologies is a leading engineering services provider featuring among the top outsourcing companies in the world. The Boeing Company recognized Cyient as the supplier of the year for two consecutive years, 2013 and 2014. Technology giant Google operates its biggest campus outside the US in Hyderabad and works as a hub for technology development. The Microsoft India Development Centre in Hyderabad is one of the largest research and development campuses of the company. These companies, for long have remained committed for driving innovation and joined hands in supporting startups. As it is evident from the choice of corporates, the ITEC relied heavily on technology companies with a strong innovation culture. With that, all the three central actors of the triple helix model were in place.

The Idea

In the next few months, rigorous rounds of meetings, focus group discussions, and interviews were conducted with the ITEC, NALSAR, IIIT, IBS, and industry leaders. It was decided that to leverage technology and innovation, a push be designed towards establishing an ecosystem for start-ups. The new-age entrepreneurs, if provided with adequate support for the actors of the triple helix model, would push forward and create success stories. In order to achieve this goal, it was decided to set up the largest incubator in Asia. It was to be named as T-Hub. T-Hub's design was to identify, encourage, support, mentor technology-based startups in Hyderabad to achieve sustained growth and eventually catalyze economic engagement.

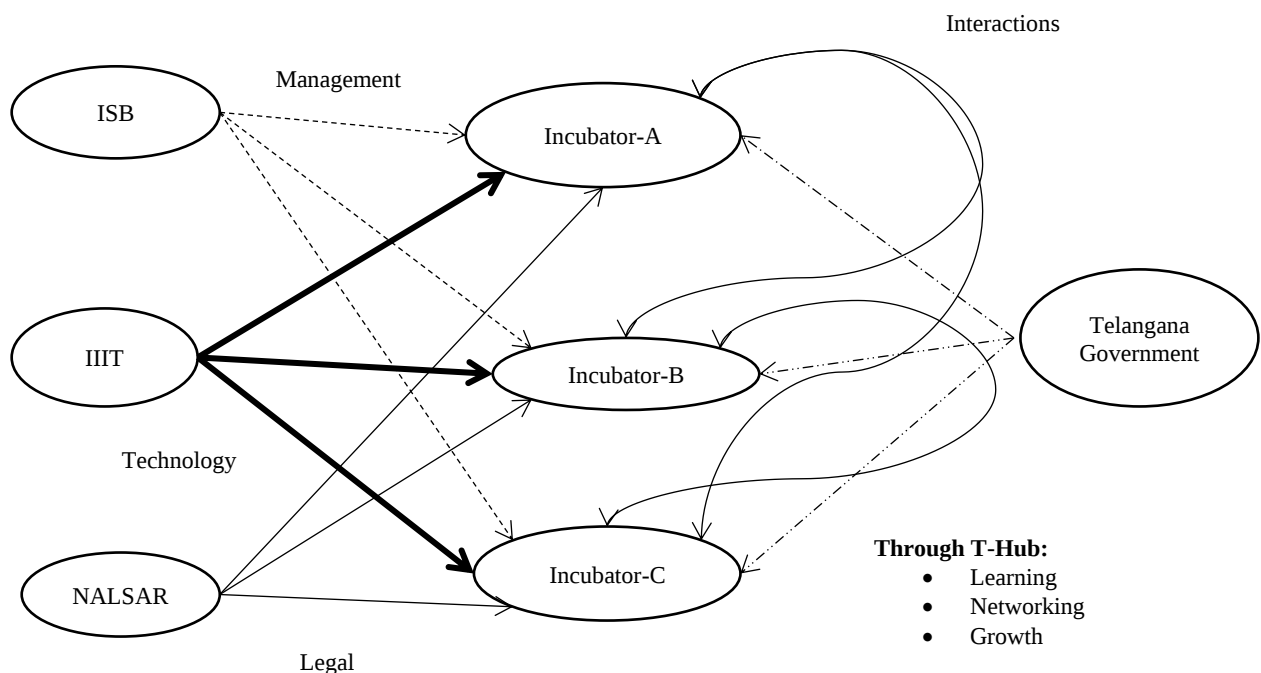


Figure 1. Triple Helix Model of T-Hub

T-Hub was strategically conceived as a not-for-profit company with the government, heads of the three academic institutions and other prominent local entrepreneurs as directors of the company. It was initially funded by the government but was designed to be free of bureaucracy. Denoted by the dashed line in Figure 1, on its part, the government launched several startup friendly initiatives like easy and quick registration, tax breaks and subsidized utilities which led to increased registration of startups. With regards to the structuring of the governing board, the secretary of the ITEC was a member along with the heads of the partnering institutes and the corporate houses. The government created a separate fund and provided for infrastructural support to the tune of seven and half million USD.

As indicated in the bold lines in Figure 1, with its locational advantage, IIIT provided space, access to advanced labs to develop and test ideas along with mentorship support. It also agreed to transfer all

its incubating startups to initiate the functioning of T-Hub. It was also decided that the IIIT would provide for faculty consultations in area of advanced technologies, robotics, Internet of Things, among other emerging technologies. Importantly, Science, Technology, Engineering, and Mathematics (STEM) students would be encouraged to follow their entrepreneurial dreams providing a boost to the startup culture that the actors envisaged.

ISB, with its global reach, provided the managerial know-how and is indicated by the dotted lines in Figure 1. It was critical for new-age technology entrepreneurs to understand the nuances of the functioning of the market. Startup founders could access the benefits of interacting and learning from globally acclaimed faculty. ISB also engaged startup founders in understanding the much-needed Go to Market strategy. Like IIIT, even ISB supported T-Hub by relocating startups at their incubation center to the new facility.

NALSAR, on its part, provided the legal support with regards to the formation and registration of the T-Hub and is indicated by the lines in Figure 1. Additionally, with its expertise in law, NALSAR agreed to organize programs on regulatory aspects of business and, most importantly, on issues of intellectual property. Also, as is the case with startups, they raise several rounds of funding from venture capitalists, and it is conducted through the legal documentation.

Finally, industry leaders brought in the capital, expertise, and experience of the market to scale startups with potential. The board room was complete with all the stakeholders conceived in the triple helix model. With its state-of-the-art facility, inspiring leadership, crafty marketing, T-Hub was launched on 7 September 2015.

Table 1. List of Mentors, Investors, Partners, and Service Providers

Service Providers	Technology Services	ZOHO, Google, Amazon Web Service, Digital Ocean, Hub Spot, IBM, Oesri India, Microsoft, Exotel, MSG91, Head Spin
	Legal and IP Services	Samvad Partners, Grandhi Law Chambers, AGR, R & A Associates
	HR and Hiring Services	HUSYS, Technogen
	Accounting and Finance Advisory services	Ebiz Corporate and tax advisors, Tirupati and Associates, Tukaram and Co.
	Sales and Marketing	Leadengine
Mentors	Technology & Science	IIIT
	Management	ISB
	LAW	NALSAR University of Law
Investors		T-Fund, Endiya Partners, Hyderabad Angels, Parampara Capital, 1Crowd, Anthill, Finverge Capital
Partners	Corporate Partners	Qualcomm, Mytrah Energy, Intel, Quantela(Paradigm), PWC, Australian Consulate, Vodafone, DBS, Samsung, CLeducate, Yes Bank, HSBC, CISCO Systems, Stanley Black Decker, Merck, REC (Rural Electrification Crp. Ltd.), IBM, United Technologies Corporation, Facebook, Uber, Deloitte, Novartis, Dr. Reddy's, HPE, Boeing
	Ecosystem Partner	Anthill, River Bridge Ventures, NASSCOM, TIE, IMAI

Source: <https://t-hub.co/>

RESULTS AND DISCUSSION

The Outcome

Since its inception and launch, T-Hub has attracted the attention of the mass. It has provided a platform for many entrepreneurs to express themselves and thereby propelled Hyderabad forward in its endeavor to become a startup destination. T-Hub offers three types of opportunity to the incubators: learning, networking, and growth. Concerning learning opportunity, T-Hub organizes tailor-made startup programs (six months duration), which is specially designed considering various factors affecting the startups in the Indian context. Senior-level executives (CEOs, CFOs, and CKOs) from corporates and entrepreneurs of proven track records are engaged in the workshops organized for the employees of

startups incubated there. Similarly, startups are provided with access to various national and international level startups competitions (e.g., “international or national demo days”). Also, a dedicated T-Hub team of experts are available for the guidance of startups during office hours.

The T-Hub assists the incubate startups in networking through (1) “one-on-one interactions with resources of mentors, investors, and partners,” (2) “negotiated partnership initiations with a curated list of service providers,” (3) “ongoing programs and competitions,” and (4) “access to T-Hub’s vibrant startup community.” The list of mentors, investors, partners, and service providers has been given in Table 1.

T-Hub provides opportunities to the startups for growth by helping them in getting: (1) 24/7 access to catalyst facility, (2) international and national visibility, and (3) access to T-Hub’s unparalleled pool of resources and knowledge. In almost two years of its existence, T-Hub has taken significant steps towards the goal that it was envisaged to achieve. It has offered its services directly to more than three hundred and fifty startups created by more than a thousand local, national, and international entrepreneurs and many more on the digital platform. Out of three hundred and fifty, more than one hundred and ninety incubates were Alumni startups. Several of the startups housed at the T-Hub have scaled up into mid-size firms generating revenues for the state through taxes apart from creating several avenues for economic engagement for skilled people.

The number of applications for space at T-Hub has increased significantly, indicating that the overall entrepreneurial activity in the state has increased. The ratio of entrepreneurs applying and those that get accepted is approximately 10:1. T-Hub has managed to invoke a sense of healthy competition among entrepreneurs resulting in tremendous activity (see Table 2) in that space in Hyderabad. Along with its partners from the industry, T-Hub launched several programs for a range of startups in various verticals such as Agri-tech, fintech, home and office access solutions, and employee recruitment and selection, among others. For example, in association with Otis (Vertical Transportation division of United Technologies Corporation), T-Hub enthused startups to work on the challenges such as automated and intelligent crowd detection, detection of human activity (eg. loitering, looking for elevator), crowd density management, etc. In addition to getting access to T-Hub’s network of mentors and service providers, the successful startups got a chance to develop a proof of concept (PoC) on the prioritized solution. Similarly in the financial services spaces, HSBC partnered with T-Hub to launch its Accelerator 2030 program to focus on creating commercialization opportunities for the multinational bank. T-Hub leverages on the fact that large corporates attempt to create open platforms so that their internal tech teams can work with other innovation teams. Since its established, T-Hub has attracted corporates to join hands in offering a platform and creating a win-win situation for both the startups and the companies. The leading players to have joined the program are Qualcomm, the elevator division of United Technologies Corporation Otis, HSBC, Facebook, Boeing, and Yes Bank.

The strategic application of the triple helix model in the form of T-Hub has started yielding rich dividends. It has helped in the development of a robust startup ecosystem in Hyderabad. As of June 2019, T-Hub, through these twenty-three programs and many other initiatives of mentorship and connect, has incubated four hundred and fifty-seven startups enabling the creation of over two thousand jobs and raising close to two hundred million dollars. Additionally, through its corporate partnership, T-Hub has raised sixty-four million dollars of funding for the startups. Startup H-Bots robotics launched world’s first smart policing robot and raised one million dollars in funding from Soniks Consulting. Another deep tech startup, Bluesemi attracted seed funding from top executives from major industry leaders such as Google, KLA Tencor, among others. Another startup from the cohort TV2Z raised four hundred and thirty thousand dollars in the latest round of funding from VB ventures, Netherlands. TV2Z helps companies track viewing data for OTT providers and helps them in providing curated customer-driven experience. StaTwig, a company specializing in Blockchain technology, became the only Indian startup to receive investment from UNICEF Innovation Fund for ensuring efficient delivery of vaccines through a robust supply-chain management system. The company also signed an MoU with the Government of Arunachal Pradesh for tracking vaccine inventory, quality, and coverage of immunization in the north-eastern state.

Table 2. List of Innovative Programs Offered by T-Hub along with its Partners

SN	Programs	Details
1	Recruitment Drive	Ex- entrepreneurs or ex-startup employees are provided an opportunity to engage with startups or corporates and even to be recruited by them.
2	Hack2Hire – A Cyber Security Hackathon	This program is launched by the T-Hub in association with United Technologies Corporation (UTC) and Hyderabad Research and Design Center (HRDC) is to enhance their talent pool for implementing projects related to product security.
3	Global Bridge: Canada-India	This program aims to assist high-potential Canadian technology-based start-ups do business in India.
4	OTIS Innovation Challenge	This program is launched by T-Hub in partnership with OTIS (Elevator division of United Technologies Corporation). It is designed to explore innovative solutions to be applicable on Elevators, Escalators, and Travellators.
5	India Market Access Bridge	This program is designed to provide assistance to entrepreneurs in expanding their startups overseas
6	REC Innovation Platform	This program helps the students to make innovations in of renewable energy area.
7	Agro Innovation on the Periphery	This program is launched by T-Hub along with Stanley Black & Decker. This is focused on empowering Agri-Tech startups.
8	Accelerator 2030	HSBC along with T-Hub launch this program to develop and maintain the start-up ecosystem. In this program, start-ups are provided with opportunities “to pitch innovative ideas, from new technologies to new business models that can revolutionize the banking operations”.
9	India Innovation Hub Accelerator Program	Through this program, T-Hub and Facebook jointly assist start-ups in having a thorough collaboration in artificial or virtual reality technology.
10	Smart India Hackathon	This program is designed as a platform for a non-stop digital product development competition for students to provide innovative solutions for technological problems.
11	Boeing Horizon X India Challenge	The program is co-created by T-Hub and Boeing and aims to make use of the Indian innovation ecosystem in specific capability areas.
12	Hack2Innovate - Multi-City Hackathon	This national level hackathon that Deep-Tech innovations.
13	T-Hub Virtual Membership	This program provides an opportunity for entrepreneurs who need specific services provided by incubators but so not need any physical space at the same.
14	Ambassador Program	This program provides an opportunity for an entrepreneur to be an ambassador for T-Hub
15	T-Scale	This program is designed to provide assistance to growth-stage startups in overcoming roadblocks and scaling at a rapid pace.
16	Smart City / Smart Building Nano Accelerator with UTC	This program is specifically designed for the Climate Controls & Security and Otis divisions of UTC to engage with a cohort of curated startups.
17	UberEXCHANGE	It is a startup mentorship program developed in association with Uber.
18	Cisco-Mtuity Smart City Hackathon	The partner organizations of this program are T-Hub, Cisco, and Paradigm Mtuity. It is designed to explore the innovations in the domain of smart cities.
19	Corporate Connect with United Technologies Corporation	This program selects startups to be engaged with UTC one on one, providing a scope for possible association and funding.
20	Qualcomm Design in India Challenge	This program is aims to develop a robust design-based technology and innovation hub in India.
21	Solve-a-thon	Hosted by Solve, Massachusetts Institute of Technology in association with T-Hub, it brings together new age start-ups to create solutions for identified global challenges.
22	Merge	T-Hub, along with Anthill, provides an opportunity for corporates to make use of the untapped potential of new ventures through key targeted partnerships.
23	YES Fintech Accelerator	This program provides an opportunity to the bank and Fintech startups to collaborate to find out innovative solutions to the problems that prevailed in banking and retail sectors.

Source: <https://t-hub.co/>

CONCLUSION

In this paper, we develop an understanding of how the triple helix model in a newly formed state in India has positively influenced the startup ecosystem. Through the case study, we studied how the organizing practices of three institutions, the university, government, and industry in the form of a balanced or hybrid type of triple helix model is shaping the future of startups. The case shows the strategic application of a hybrid or balanced Triple Helix Model for encouraging entrepreneurial activity at Hyderabad by the Government of Telangana for optimum results. In the study, it was evident that the three actors exhibited the spirit of collaboration and technology transfer (Ranga & Etzkowitz, 2013). The industry with expertise in domain knowledge such as agriculture, banking, and access control system like elevators and accelerators helped in delivering technical know-how to the startups and encourage them to innovate with the help of mentors from academia and facilitation of the government.

The case explains the status of the various components of the model pre-intervention. It is particularly important as the model to be used as an intervention has certain perquisites and cannot be expected to deliver results without them. The case elaborates the steps taken by the Government and the Industry while introducing the model in the city of Hyderabad. It is important to note here that this case is an excellent example of government-led strategic intervention of such kind in India. The case can be used to teach strategic management to business students, wherein they can develop a clear understanding of stakeholders and their participation while taking strategic decisions. It can also be used in courses of public administration to explain how strategic interventions led by the Government can be formulated and rendered for best and desired social outcomes.

In particular, the role of universities is found to be profound. In the context of the case setting, it is clear that universities played a pivotal role by offering vital inputs that were important for the establishment of the startup ecosystem. Enabling activities including managerial assistance and consulting services were offered by a globally renowned business school which otherwise would have been almost impossible to access, technical knowledge, product testing facilities etc. were provided by IIIT, which too is a destination of choice for aspirants of STEM education and boasts of global standard labs and finally, all types of legal aid including vetting of contracts, funding agreements, tax filings etc. were offered by NALSAR, a top law university of the country. Though the government facilitated the ecosystem by making policies that were conducive, it was universities which propelled the ecosystem towards success and thereby justifying the fact that they are a key stakeholder in the process of startup ecosystem development.

Limitations and Future Research Agenda

This paper shows the fundamental role that universities play in the establishment, development and resultant success of the Triple Helix Model in the modern entrepreneurial setup in cities, states and nations. However, it must be noted that adoption and adaptation are to be contextualized and matched with the overall goals for desired outcomes. This paper provides a validation to the research by Etzkowitz and Klofsten (2005) and Zheng and Hu (2018) where it was proposed that academic institutions and universities be considered at par with the government and the industry to create a co-created cohesive ecosystem wherein each brings in its best capabilities and leads in specific areas rather than any one of them leading and the others following. In that way, the study is limited as it uses a single case to test the proposed model. It also provides a clarion call to future researchers to test it in similar yet geographically distinct areas and check its validity. Also, it is proposed that future researchers may adopt a longitudinal method to study the impact of similar attempts over time which may provide opportunities for a robust analysis and understanding of the phenomenon.

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Recommended Citation:

Pattnaik, P. N. & Pattnaik, B. (2022). Nurturing Technology and Innovation for Sustained Growth: Role of Universities. *Journal of Business and Entrepreneurship*, 10(2), 133-144.

This article is available online at:

<http://ojs.sampoernauniversity.ac.id> (ISSN: 2302-4119 Print, 2685-6255 Online)