



# Competitiveness of High-Tech Start-Ups and Entrepreneurial Ecosystems: An Overview

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## Abstract

High-tech start-ups are emerging rapidly all over the world, particularly in the developed world and emerging economies, since the early 2010s. So are the entrepreneurial ecosystems. Despite the growth in ecosystems, the rate of success of high-tech start-ups has hardly experienced an increase during this period. As a result, while an innumerable number of high-tech start-ups emerge, a considerably small proportion of the emerged ones is able to survive, and only a negligible proportion of the survived ones scale up. Though the number of Unicorns emerged from the start-up hubs has increased significantly in 2021, these Unicorns still account for a minute proportion of the emerged high-tech start-ups in almost every start-up hub recognized globally. This brings to the fore the critical importance of “competitiveness of high-tech start-ups”, and the need to explore the factors which determine the competitiveness, in the context of entrepreneurial ecosystems. It is against this backdrop that we invited scholarly articles, empirical studies, reviews and perspective papers based on the theme “Competitiveness of High-tech Start-ups and Entrepreneurial Ecosystems”. This article presents the editorial observations, summary of the select articles, followed by future research directions (for academicians) and provides managerial and policy recommendations.

**Keywords** High-tech start-ups · Competitiveness · Ecosystems · Entrepreneurship · Innovations

## The Context

Technology innovation-induced and technology-based high-tech start-ups and their competitiveness as well as their entrepreneurial ecosystems have been increasingly attracting the attention of both policymakers and empirical researchers in recent decades, across the world. The increasing interest in high-tech start-ups can be justified on three grounds, namely (i) they have the ability to transform an economy by means of their contribution to national income, employment, innovated products and services, and even exports, (ii) they are in fact emerging rapidly in developed countries as well as in emerging economies, and (iii) they have a very high failure rate (Eisenmann, 2021; Krishna et al., 2021; Song et al., 2008). Likewise, the increasing interest in entrepreneurial ecosystems can be justified on three grounds, namely (i) entrepreneurial ecosystems are emerging rapidly

in developed as well as emerging economies which facilitate the emergence of tech start-ups, (ii) high-tech start-ups are thriving only in certain locations/regions, and such locations/regions are identified with the presence of an entrepreneurial ecosystem, and (iii) a high-tech start-up has a higher probability of early emergence, early sustenance and early success when it is inserted in an entrepreneurial ecosystem (Bala Subrahmanya & Krishna, 2021; Maroufkhani et al., 2018; Ratten, 2020).

Therefore, high-tech start-ups are considered both agile and fragile. They are the engines of innovation and means of entering new markets. A high-tech start-up (new venture) creation requires a series of actions. The process of a high-tech start-up creation begins with an idea or opportunity recognized by a start-up founder (Salamzadeh & Kesim, 2017). The ideation stage is followed by a proof of concept, prototype development, minimum viable product and achieving product-market-fit leading to product launching in the market. A typical founder of a high-tech start-up or a new venture, that is, the entrepreneur is mostly focused on the development of his/her idea through these multiple phases (Salamzadeh & Kirby, 2017). This concentration

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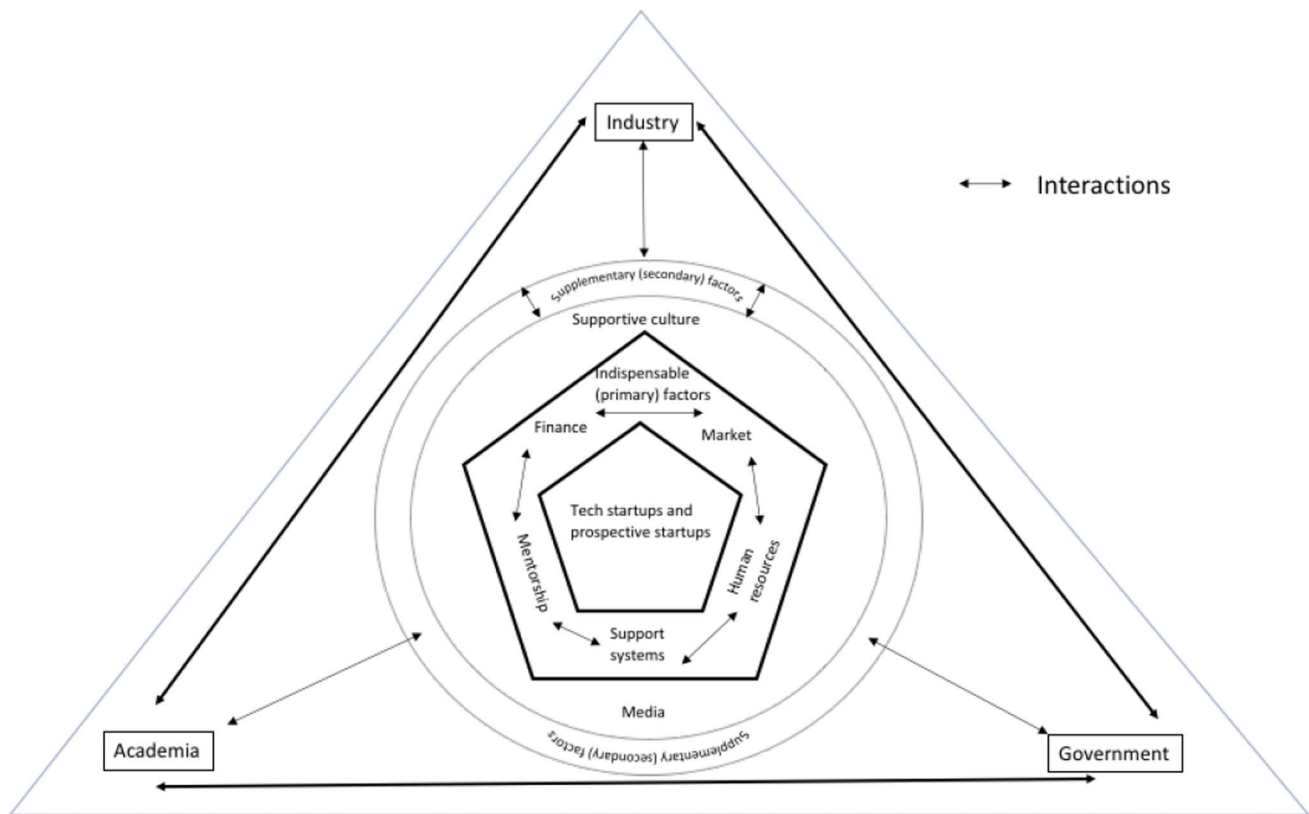


Fig. 1 Entrepreneurial ecosystem structure

might lead to mismanagement or failure of the start-up due to multiple reasons such as inability of founders to access financial resources, mentorship, market identification, and talented human resources, among others (Chorev & Anderson, 2006). Most start-up founders may miss some points or critical stages depending on their knowledge, ability, and networks, and this could significantly determine the rate of success/failure of their new ventures (Ganesaraman et al., 2021; Salamzadeh & Kesim, 2015). Thus, the human capital of founders will have a profound influence on the ability and competitiveness of high-tech start-ups to emerge and grow (Colombo & Grilli, 2010; Santisteban & Mauricio, 2021). This will be even more so, if the ecosystem in which high-tech start-ups emerge and grow is not adequately developed to support the new ventures (Bala Subrahmanya, 2020a; Ratten, 2020).

The track record of emergence and accelerated growth of innumerable high-tech start-ups from Silicon Valley and Boston area of the US, and that of Israel in the recent decades contributing to national economic prosperity has substantiated the role and importance of high-tech start-ups and their competitiveness, and entrepreneurial ecosystems in national economic development strategies. However, an entrepreneurial ecosystem for high-tech start-ups is invariably regional in character since there are differences between

regions in terms of policies, culture, concentration of firms, education institutions, markets, human resources, and availability of finance, among others (Cukier & Kon, 2018). An entrepreneurial ecosystem comprises a set of actors and factors coordinated in such a way that they enable productive entrepreneurship and competitiveness of high-tech start-ups within a particular territory (Stam & Spigel, 2017).

The entrepreneurial ecosystem comprising actors and factors can be defined as a structure with a nucleus surrounded by two outer layers and a triple helix base (Fig. 1). The nucleus would include start-up founders and prospective start-up founders, and the first outer layer comprises five indispensable actors/factors (finance, market, human resources, support system including incubators and accelerators, and business and technology mentors) without which an ecosystem may not emerge, even if it emerges it may not survive, and even if it survives it may not be effective. The outer-most layer comprises two supplementary factors (culture and media) which are not imperative but play a supportive role. The triple helix base consists of government, industry and academia which form a fundamental base to an ecosystem, as they can nurture and generate both indispensable and supportive factors/actors. These actors and factors interact constantly which generate entrepreneurship in the form of start-up founders and prospective ones. The degree

and quality of interactions would also make a difference for the competence and competitiveness of high-tech start-ups and, therefore, for their success and failure over their life cycle (Bala Subrahmanya, 2021).

The triple helix model consisting of academia–government–industry and their interactions was originally proposed by Etzkowitz and Leydesdorff (1995). A triple helix regime typically starts as university, industry and government enter into a reciprocal relationship with one another in which each attempt to enhance the performance of the other. Such initiatives take place at the regional level where specific contexts of industrial clusters, academic development and presence of government authorities influence the development of the triple helix (Etzkowitz & Leydesdorff, 1995, 2000). It is the interactions among them which produce hybrid organizations such as science parks, spin-offs, university-run enterprises, and incubators over a period of time (Etzkowitz & Leydesdorff, 1995, 2000).

Given the above, entrepreneurial ecosystems are observed to emerge and evolve over a period of time. Such ecosystems undergo different phases of evolution: (i) nascent, (ii) evolving, (iii) mature, and (iv) self-sustainable (Cukier & Kon, 2018). Among the entrepreneurial ecosystems globally, Silicon Valley stands apart from the rest (Pique et al, 2018). Only Silicon Valley would have reached the stage of self-sustainability whereas the various other recognized ecosystems are still undergoing evolution. The top slot occupied by Silicon Valley annually on a continuous basis and the varying ranks of remaining ecosystems in the world over a period of time are a reflection on this fact (Startup Genome, 2022). Silicon Valley symbolizes USA's high technology competitiveness, as it has adapted successfully to new technologies and new competitors. As a result, it is the most attractive and influential model for imitation, adopted globally for regional development. Technology parks and technology incubators have been emerging elsewhere because of these imitating exercises. Overall, Silicon Valley continues to be the ultimate measure of success (Leslie & Kargon, 1996).

Though India occupies a unique position as a potential source of high-tech start-ups, the rankings of Indian start-up ecosystems, particularly that of Bangalore has rather steadily declined over the period. On the contrary, other leading Asian entrepreneurial ecosystems, namely Beijing, Shanghai, Tokyo, Seoul, Singapore and Shenzhen continued to remain within the top 20 global ranks during 2017–2021, despite variations in their annual ranks (Startup Genome, 2022).

Given this, how do entrepreneurial ecosystems emerge and graduate from one phase to another has not been adequately studied in the international context, yet. This is an important, exploration-worthy research gap because the level of maturity of an entrepreneurial ecosystem will have a profound influence on the competitiveness of high-tech

start-ups. However, there is widespread realization that an entrepreneurial ecosystem for high-tech start-ups emerges as a result of a variety of factors interacting with one another in highly complex and idiosyncratic ways. Therefore, it is neither desirable nor feasible to replicate a successful one, even within the same country. What is appropriate is to understand the overall structure and its components (Bala Subrahmanya, 2017). The emergence and growth of an entrepreneurial ecosystem is an evolving process but it will neither evolve naturally nor can it be built by an intelligent design. As argued by Isenberg (2011), ecosystems are usually the result of intelligent evolution, a process which blends the invisible hand of market forces and the deliberate helping hand of public policies.

Accordingly, public policy support for promoting entrepreneurial ecosystems has been increasingly emerging across the world (Brown & Mawson, 2019). Particularly, India has been recognized as one of the potential sources of high-tech start-ups in the global economy, for almost a decade now (Gai & Joffe, 2013). Since then, both national government and more and more regional governments have been introducing and revising exclusive start-up promotion policies. Today, 30 of the 36 States and Union Territories in India have a dedicated Start-up Policy, apart from that of the national government (Startupindia, 2022). Even in the developed world, OECD countries have created exclusive start-up promotion policy instruments (METI, 2021; WEF, 2020; GIZ, 2022). However, to what extent policies and policy instruments have aided the graduation of entrepreneurial ecosystems and thereby determined the competitiveness of high-tech start-ups, is not yet ascertained, which describes another major research gap deserving exploration in the future.

Entrepreneurial ecosystems in general enable a steady emergence of start-ups but the competitiveness of the emerged ones to sustain and/or to scale up would depend on the strength of the ecosystems (Santisteban & Mauricio, 2021). The availability of finance, size of markets, quality of human resources, availability and quality of business and technology mentors, size and quality of accelerators and incubators (the five indispensable factors/actors) and their interactions with the start-up founders/prospective founders would together determine the quality of entrepreneurial ecosystems and the rate of emergence, survival and success of high-tech start-ups. While empirical research is available in plenty on start-up growth and performance, what is still at its infancy is the exploration on the role of actors/factors in the nurturing of competitiveness leading to the emergence and gradual/accelerated growth of start-ups. Equally important is the decision-making ability of high-tech start-up founders and prospective high-tech start-up founders at critical junctures over the start-up life cycle journey. It is against this backdrop that we issued a call for papers for the

Special Issue on “Competitiveness of High-Tech Start-ups and Entrepreneurial Ecosystems”.

### Special Issue Call for Papers on “Competitiveness of High-Tech Start-Ups and Entrepreneurial Ecosystems”

The special issue (SI) of JGBC is offered as a forum for the dissemination of latest research focusing on the competitiveness of entrepreneurial ecosystems and high-tech start-ups, for the advancement of knowledge in this fast emerging area. The major focus of the special issue is to understand how can entrepreneurial ecosystems support high-tech start-ups in these times of macro-economic uncertainties and enable them to retain and enhance their competitiveness (Momaya, 2001). The call invited original contributions, preferably based on empirical research, focusing on multiple environments with multiple authors. The SI call was hosted on the JGBC website as well as on social network sites. This call attracted hundreds of enquiries and many paper submissions from different countries between August and November 2021. The submissions arrived from multiple disciplines such as Economics, Energy, Entrepreneurship, Finance, Operations Management, and Operations Research comprising both quantitative and qualitative studies. The submissions involved both literature review and field survey/case study involved empirical analysis based studies. Overall, the diverse country-origin, discipline base and nature of research exemplified the significance of chosen topic of research.

The reviewers, JGBC editorial office, Guest editorial team and Editor-in-chief ensured an objective but fairly quick review process and provided feedback to authors with ample time for multiple revised submissions. The criteria used for selecting papers for this SI were that the research must be of top quality, representative of a variety of topics within the domain of entrepreneurial ecosystems for high-tech start-ups, and of likely interest to JGBC readers. The 10+ papers were distributed equally among the JGBC consulting editor and four members of the Guest Editorial team, and no editor handled a manuscript from a colleague or a co-author. The JGBC consulting editor and four Guest editorial members consulted each other at the end of the first round to read all of the referee reports and make editorial decisions for resubmission or rejection. Further, mutual discussions were held through e-mail interactions for the subsequent rounds of reviews. Finally, in total, eight papers are included in the SI, as summarized as follows.

### Papers in This JGBC Special Issue

*A Decision-Making Framework for Entrepreneurial Venture in Emerging Economies* by Shashi Bushan Kumar and Nandan Sudarsanam proposed a framework for decision-making in an entrepreneurial setting based on experimentation. Entrepreneurship for a high-tech start-up involves identification of an opportunity followed by a series of steps ranging from ideation to proof of concept, prototype development, minimum viable product, product-market-fit to early product marketing. Along the way, start-up founders encounter many decision-making problems pertaining to strategy and operations. Decision-making in an entrepreneurial ecosystem is quite a challenge due to inadequate information, market risks, uncertainty in the availability of required resources, dynamic business environment, etc. Right decision-making can have a decisive influence on the growth performance of a start-up. Therefore, Kumar and Sudarsanam have proposed a framework for decision-making in an entrepreneurial setting based on experimentation, in their research study. At the outset, they posited that entrepreneurial decision-making can be modeled in the settings of contextual bandits. Accordingly, they developed aspects of decision problems, entrepreneurial ecosystem, and experiments, which impact decision-making processes and its associated cost. Subsequently, they could develop propositions pertaining to association between decision problems, ecosystem, and entrepreneurial growth.

Finance is the life and blood of business, irrespective of its form and size. The same applies to high-tech start-ups, rather more intensely. That is why, financing schemes for start-ups is widely prevalent in the entrepreneurial ecosystems of both developed and emerging economies today. Further, unlike financiers to other forms of business, financiers to start-ups more often perform various value-adding activities for the promotion of start-ups, within an entrepreneurial ecosystem. They perform multiple roles such as mentors, market identifiers, human resource providers, network builders, obtaining further rounds of finance, etc. Tore Frimanslund, in his study titled, *Financial Entrepreneurial Ecosystems: An Analysis of Urban and Rural Regions of Norway*, examined the role of finance and interrelated value-adding activities in ecosystems, with reference to 11 rural and urban innovative start-ups and stakeholders in the Norwegian market for entrepreneurial financing, based on entrepreneurial ecosystem perspective. He disentangled the term recycling of entrepreneurial resources in ecosystems, which is a self-enhancing cycle of finance under specified conditions that allows enhancement of ecosystems and members. He contended that such activities have a profound influence on the robustness of entrepreneurial ecosystems and thereby on entrepreneurial and regional growth.

Despite operating out of a vibrant entrepreneurial ecosystem, high-tech start-ups may fail due to contradictions, internal or external or both. One of the key challenges which start-up founders tend to encounter in any stage of a start-up lifecycle is conflict. Conflict may emerge between co-founders or between co-founders and investors or between co-founders and suppliers/customers. Conflict management can have a decisive influence on the performance of a high-tech start-up. Given this, it is essential to understand how do conflicts differentiate success and failure of tech start-ups? How do conflicts impact the start-up lifecycle comprising multiple stages of evolution? Ganesaraman and Bala Subrahmanya in their study titled, *How Conflicts Cause Technology Start-up to Fail in India? An Empirical Analysis*, have explored the role of conflict in the success/failure of tech start-ups, based on primary data gathered from 101 failed start-ups and 50 successful ones spreading over six leading start-up hubs of India. Their empirical analysis revealed that the presence of conflicts between co-founders or conflicts between co-founders and investors aggravates the odds of tech start-up failures across the lifecycle stages. The study brought out the significance of navigating and resolving potential conflict issues related to relationships, roles, and rewards. Further, putting in place a proper governance structure at the outset, will ensure a smooth/intervention-free relationship with investors. It also signifies that it is not enough if co-founders have complementary qualifications and skill sets, rather what is more crucial is to ensure compatible personalities among the prospective co-founders, before venturing into a new business.

An appropriate support system in the form of Technology Business Incubators (TBIs), Accelerators and Co-working spaces can make a significant difference to an entrepreneurial ecosystem for the origin and growth of high-quality, high-tech start-ups. Of these, TBIs are largely policy support driven (unlike accelerators which are promoted by the corporate sector and co-working spaces promoted by individual entities) and they emerge rapidly in almost all entrepreneurial ecosystems in the world today (Bala Subrahmanya, 2020b; Madaleno et al, 2021). Accordingly, empirical research focusing on the role and effectiveness of TBIs has increasingly emerged in recent times. However, research output is scattered preventing a comprehensive understanding of the significance and performance of TBIs. To address this gap, Vidit Mohan and Rohan Chinchwadkar in their study titled, *Technology Business Incubation: A Literature Review and Gaps*, developed a Systematic Literature Review (SLR) to identify the prominent research themes and theoretical lenses employed in the incubation research from 2015 till 2021. This enabled them to explore the role of TBIs in facilitating incubatee growth and competitiveness in the recent period. An important research gap identified by them pertained to the absence of a practical approach to throw

light on how and why the various functions are performed in a TBI, which have a significant bearing on TBI performance. This reveals that it is important to explore the selection criteria, incubation process and graduation yardsticks of TBIs, which would determine the quality of prospective incubatees as well as the performance of a TBI itself.

A significant fall-out of start-up boom in emerging economies is the upsurge in demand for technology talent. Both Information Technology (IT) companies and high-tech start-ups vie for technology talent in the same ecosystem. This has led to a mismatch in the earnings of technology workers in the two domains. Muralidharan's paper titled *Competing for technology talent: Listed companies versus funded startups in India*, has explored this issue in his research work based on secondary data for IT service companies and funded tech start-ups. He concluded that IT companies continued to remain large buyers of technology talent and they had an upper hand due to payment of higher wages relative to tech start-ups, though the rate of growth of salaries was higher for the later. The higher growth of salaries to tech workers from tech start-ups could be an outcome of prevailing salary disparity between the IT companies and tech start-ups and the resultant difficulty in attracting appropriate tech talent by the later. The ability of tech start-ups to attract external funds in a big way, and their successful performance may lead to bridging the gap between the two, in favor of tech start-ups attracting more technology talent in the future. However, in general, the liability of newness and the liability of smallness are likely to put tech start-ups at a disadvantage relative to established IT companies, irrespective of the level of development of an economy. Given this, the gap between the earnings of tech workers of IT companies and that of tech start-ups is likely to persist even in the long run.

High-tech start-ups succeed in an entrepreneurial ecosystem due to a variety of factors, and empirical studies tend to bring them out either in isolation or in discrete groups. But many of these factors contributing to success may influence one another, and it is their combined or cumulative effects which would influence the success of a start-up. Therefore, it is appropriate to consider the interactive effects of all the feasible success factors simultaneously. Abhishek Kumbhat and Sushil have addressed this research gap in their research work titled *Interactive Effect of Successful Factors for High-Tech Startups: Value Propositions, Target Market and Operational Excellence*. They compiled a list of 33 success factors associated with the value proposition, market, and operations. The interrelationship between these factors was illustrated through Total Interpretive Structural Modeling (TISM). Their analysis ascertained that among all, it is 'building innovation culture in the team' and 'comprehensive pre-start-up planning' with 'growth and size of the market' which are the root factors contributing to success. Their findings are expected to benefit start-up founders by offering

appropriate value propositions and operational excellence. It will also enable the stakeholders of entrepreneurial ecosystems for high-tech start-ups to embed the start-ups they are propping up with proper ingredients to ensure success, and together strengthen the overall entrepreneurial ecosystems, particularly for early-stage start-ups, and thereby prevent or bring down the rate of start-up failure.

Though start-ups have multiple avenues to obtain finance, Venture Capital (VC) finance is the most dominating one, which is experiencing an exponential growth across the world, including India. The conducive policy environment, rapid expansion of the market, and a healthy macro-economic environment have attracted a steady inflow of VC investments into India in the last two decades. Though VC funding was largely confined to early-stage start-ups and scaling up of start-ups was rare initially, of late, both Initial Public Offerings (IPO) and Mergers and Acquisitions (M&As) have emerged as viable options for scaling up and growth. Against this backdrop, Kshitija Joshi, Deepak Chandrashekar, Krishna Satyanarayana and Apoorva Sreenivas have examined the impact of valuations and VC funding on the components of entrepreneurial ecosystem in India and its repercussions on the macro-economic situation, in their perspective paper. The analysis and findings have three important dimensions: one, it examined the influence of current business models pursued by VC funded start-ups on the society and labor market; two, it explored the impact of VC funding on wealth creation at the Bottom of the Pyramid (BoP) and, three, it ascertained the influence of VC funding on innovation. Based on their findings, the authors have prescribed necessary actions to practitioners and policy makers to ensure a more inclusive and equitable growth of the sector and the economy.

High-tech start-ups are springing up in a wide variety of sectors, in general, and more so in an emerging economy like India. An area which holds immense promise for start-up growth is the renewable energy sector in India. However, if the potential of the sector has to be exploited adequately for the benefit of start-ups, the necessary industrial ecosystem must be nurtured, which calls for policy intervention. Gita Surie's paper titled *Scaling the Innovation Ecosystem for Renewable Energy: The Case of India* has examined the macro- and micro-level mechanisms that facilitate scaling up of an industrial ecosystem in her work. She has developed a framework based on the data that draw on the National Innovation System (NIS) literature and institutions combined with research on industrial and entrepreneurial ecosystems. Her research findings highlight the role of policy intervention and strategies adopted by start-ups and other established organizations in contributing to the development of the solar and Renewable Energy ecosystem in India. It offers insights for entrepreneurs, executives and policy makers towards

designing and scaling up of an industrial ecosystem for sunrise industries.

Overall, these papers have given a wide perspective of issues relating to the competitiveness of high-tech start-ups and their entrepreneurial ecosystems, largely in the context of Indian economy. It is in this context that newer research issues need to be identified and elaborated.

## Challenges for Academic, Managerial and Policy Decision-Making

As of now, academic research on high-tech start-ups and their ecosystems is largely in the form of conceptual, review, case and primary data based studies. This holds good particularly in the Indian context. This is because there is no official or private source of exhaustive secondary data available on high-tech start-ups. This largely impedes comprehensive macro academic research, and high-quality managerial decision-making, and thereby prevents the generation of insights for efficient policy making, nationally as well as regionally. This in turn would hinder appropriate addressing of concerns of high-tech start-ups to enhance their productivity and competitiveness.

In fact, high-tech start-ups which emerge and survive are steadily exposed to greater challenges. That is why, while an innumerable number of high-tech start-ups emerge year after year increasingly, only a small proportion of them survives and still a smaller proportion is able to scale up to reach the status of Unicorns (any private company whose valuation is \$1 billion or more). While there were about 60,000 start-ups, only 90 of them are Unicorns in India in 2021, amounting to a (Start-ups to Unicorns) ratio of 667:1 (Srivastava, 2022). This implies that the emerged high-tech start-ups are not able to develop their competitiveness adequately for survival, and the survived high-tech start-ups are not able to enhance their competitiveness for further growth and scaling up. This calls for more systematic data support for research, and research-based decision-making and policy making to enhance the competitiveness of high-tech start-ups. Therefore, there is an urgent need to develop an exhaustive data base of high-tech start-ups comprising variables such as product code, location, investment, sources and stages of investment, employment, background of founders, stage of operations, and sales turnover, among others. This would give the much needed impetus for macro academic research, managerial decision-making and policy making to promote the competitiveness of high-tech start-ups.

Another issue which deserves attention in the current global context is the impact of Covid-19 Pandemic on high-tech start-ups, their competitiveness and their ecosystems. The imposition of national and regional lock downs in different nations turned out to be a boon for Internet start-ups as

they enabled contactless delivery of products and services, while facilitating their employees to work from home. This is reflected in a sudden upsurge in the number of unicorns emerged from diverse ecosystems across the world in 2021 relative to pre-2021. The number of unicorns emerged globally in the last six years were as follows: 63 (2016); 78 (2017); 145 (2018); 143 (2019); 171 (2020) and 269 (2021) (Eckert, 2022). India recorded an unprecedented increase in the number of unicorns by more than doubling from 44 to 90 in 2021 (Srivastava, 2022). But there is no empirical evidence to argue that it was Covid-19 Pandemic which enabled the emergence of increased unicorns from different start-up hubs globally. This is because how has Covid-19 Pandemic impacted the competitiveness of high-tech start-ups for their emergence, stability and growth has not been explored adequately.

Nevertheless, the current trends of research do enable derivation of further scope for future research, managerial implications and policy imperatives. An elaboration on each is in order.

## Recommendations for Future Academic Research

At the outset, we have noted that entrepreneurial ecosystems evolve over a period of time, which in turn, have a profound influence on the competitiveness of emerged as well as prospective high-tech start-ups. Therefore, policymakers have been introducing policy instruments or exclusive policy support to strengthen ecosystems as much as the competitiveness of emerging high-tech start-ups. However, it is not yet clear how do entrepreneurial ecosystems emerge and grow to attain maturity and subsequently become self-sustainable? Further, it is not clear why some ecosystems grow faster and contribute to the competitiveness of high-tech start-ups better than some others within the same country, macro-economic policies and national start-up policy remaining the same? If an economy has to accelerate the emergence and growth of high-tech start-ups in a big way, it is equally imperative to examine what factors critically influence the competitiveness of high-tech start-ups within an entrepreneurial ecosystem so that success rate of the emerged ones can be enhanced and consequently failure rate can be minimized.

In emerging economies like India in particular, the role of policy support cannot be overestimated. Indian entrepreneurial ecosystems in general lack sophisticated industrial infrastructure, high-quality manpower, adequate mentorship and markets, sources of finance, and matured support system comprising accelerators, incubators and other appropriate soft skill providers. Though all the major Indian ecosystems do have growing relationships with leading high-tech

start-up ecosystems such as Silicon Valley, Boston, and London on the west, and Singapore, Tokyo, and Seoul on the east, they are, of late, declining on the global rankings (Startup Genome, 2022). Even the global rankings of other leading start-up hubs, excluding that of Silicon Valley, are varying from year to year. The influence of entrepreneurial ecosystems on the competitiveness of high-tech start-ups is also reflected in terms of the number of unicorns emerged from different economies, which is again varying from year to year (Startup Genome, 2022). In the later part of the previous decade, Europe has emerged as the major source of unicorns followed by the USA, Rest of Asia (excluding China), China, and the Rest of the World.

Given the above, the following 12 issues emerge relevant:

- What is the threshold level of maturity required for a steady generation of competitive high-tech start-ups?
- How do the ecosystem components contribute to the enhancement of competitiveness of high-tech start-ups?
- How to ensure a steady growth of ecosystems so that emerging high-tech start-ups have the competitiveness to grow and scale up?
- How do policies influence ecosystems and competitiveness of high-tech start-ups?
- Does the progress of ecosystems have any determining influence on the competitiveness of high-tech start-ups?
- Does the market size of an ecosystem within an economy influence the competitiveness of high-tech start-ups?
- What role do networks play in strengthening the competitiveness of high-tech start-ups?
- How did Covid-19 Pandemic affect the high-tech startup competitiveness and high-tech start-up ecosystems?
- What are the unique competitive features of unicorns relative to other high-tech start-ups? How to ensure a steady increase in the generation of unicorn high-tech start-ups?
- Is the current definition of unicorn adequate to ensure a start-up's subsequent growth and scaling up, from an ecosystem angle?
- What is the role of triple helix base (comprising academia, government and industry) in enabling a steady generation of competitive high-tech start-ups, in times of crisis?
- How to develop a comprehensive understanding of 'empirical entrepreneurship' in the context of emerging economies vis-à-vis developed economies?

## Recommendations for Managers and Practitioners

The following 12 suggestions are worth considering:

- Entrepreneurship is embedded with an ecosystem in which an entrepreneur emerges and operates. Therefore, an appropriate understating of the ecosystem is a pre-requisite for recognizing and creating opportunities by entrepreneurs.
- It is imperative to understand the process of opportunity recognition and opportunity formation, towards the creation of a successful start-up.
- Develop networks within as well as beyond the entrepreneurial ecosystem in which you emerge and operate.
- Understand the strengths and weaknesses of your entrepreneurial ecosystem before you plunge in to the world of high-tech entrepreneurship.
- Ascertain the policy initiatives applicable to your product domain, and try to sue them to your advantage.
- Explore the sources of finance accessible, and the non-financing value-add services they can provide to a high-tech start-up.
- Know the support system existing in the entrepreneurial ecosystem in the form of accelerators, incubators and co-working spaces, and other soft-service providers.
- Judge the need and role of technology and business mentors for high-tech start-ups.
- Identify compatible co-founders (in terms of complementary skills as much as personalities) for setting up a high-tech start-up.
- Put in place a dispute resolution mechanism at the outset, to deal with conflicts with co-founders as well as investors.
- Have a plan for talent acquisition in the midst of ever growing gap between demand and supply for skilled technical workforce.
- Appreciate the role of high-tech large firms as the collaborators, sources for early product markets, human resources, mentors, co-investors, and even accelerators for scaling up, among others.
- Formulate a coordinating body between accelerators, incubators and co-working spaces, for the benefit of prospective start-up founders. Explore the possibility of a prospective start-up founder/s to begin the journey of start-up creation from co-working spaces (for ideation) to incubators (for proof of concept, minimum viable product, product-market-fit, and venture creation) and then to accelerators (for expansion and scaling up).
- Initiate subsidiaries of Public Sector Banks for exclusively financing emergence, sustenance and scaling up of high-tech start-ups, in all major start-hubs.
- Facilitate market access beyond the country as far as possible, through bilateral and multilateral agreements.
- Develop an exclusive database for high-tech start-ups comprising variables such as product code, location, investment, sources and stages of investment, employment, background of founders, stage of operations, and sales turnover, among others.
- Develop a database of accelerators, incubators and co-working spaces along with the services rendered by them for providing in the public domain.
- Rank the start-up ecosystems in the country, on similar lines to states' startup ranking done in India.
- Formulate an evaluation framework for assessing the growth of start-up ecosystems, on annual basis, for introducing corrective measures for further growth.
- De-bureaucratize the entry and exit operations of high-tech start-ups.
- Set up a Start-up Research Centre (StaRC) in the Department for Promotion of Industry and International Trade (DPIIT), Government of India to promote policy oriented research.

Overall, it is the involvement of the triple helix (academia, industry and government) both at the national level and at the regional and start-up hub level in the promotion of high-tech start-ups, which would strongly determine the competitiveness of high-tech start-ups. Due attention to the above discussed issues would go a long way in strengthening and promoting entrepreneurial ecosystems, high-tech start-ups and their competitiveness not only at the stage of emergence but more importantly at the stage of stability and scaling up. This would facilitate the emergence of an increasing number of unicorns in shorter periods of time, with more employment, innovated products, income and exports.

## Recommendations for Policy Makers (in an Emerging Economy Like India)

The following 12 policy initiatives are suggested:

- Promote industry-institute partnerships with an exclusive focus on engineering, medical, science and management higher education institutions. This would help generation of competitive high-tech start-ups.
- Define pathways for patent commercialization generated in higher education institutions, for the creation of high-tech start-ups.
- Policy focus must be on graduation and scaling up of high-tech start-ups as much as on creating high-tech start-ups.

## Key Questions Reflecting Applicability in Real Life

1. Why must a high-tech start-up founder learn about the entrepreneurial ecosystem in which they intend to create a start-up?



2. What are the major stakeholders of an entrepreneurial ecosystem? How are they related to high-tech start-ups or prospective high-tech start-ups?
3. How can a prospective high-tech start-up founder reap crucial benefits from an entrepreneurial ecosystem for start-up creation?
4. How do accelerators, technology business incubators and co-working spaces help high-tech start-ups in different stages of their lifecycle?
5. What are the appropriate methods of data creation on high-tech start-ups in an emerging economy?

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