

Enabling Environment for Technology based Startups in India: A Review of Literature

Umang Gupta*

Academy of Scientific and Innovative Research, CSIR - National Institute of Science Technology and Development Studies, K.S. Krishnan Marg, Pusa Campus, New Delhi-110012, India

1. Introduction

Entrepreneurship has become the driving force of economic and social development throughout the world. In recent decades, research has produced theories, evidences and new insights that have changed the prevalent view about the role of entrepreneurship in innovation and technological change. The earlier view suggested that small businesses lacked knowledge resources which distorted the vision of generating innovative output (Acs and Audretsch, 2005). The 21st Century knowledge-based economy calls for new approaches to create and exploit knowledge, thinking beyond the established models of innovation and commercialization. This has resulted in paradigm shift in the policy debate and implementation strategy of various countries, creating new institutional mechanisms for developing knowledge-based products. These new institutions include systems like science parks or knowledge parks, accelerators; financial institutions like venture capitalists, angel investors and other microfinance institutions; Business support institutions including IPR Regime, incubators, etc. which enable the growth of startups and entrepreneurship in a country.

Innovation and entrepreneurship have emerged as a key area of focus with the understanding driven by empirical evidence that successful linking of these two aspects can lead to strong economic growth and social welfare. Policy articulations and implementation strategies underscore the desire to bring different stakeholders together to exploit opportunities and white spaces. Terms like entrepreneurship, incubation, startups are finding space in the new programs of government. Innovation is an important concern of each organization for its role in the development and coordination of the market.

The innovation system studies support that societal structures play a significant role in impelling technological changes, and also to an extent impact long-term economic growth. Time has seen the characteristics of technology change. According to Kraemer (2005), the present era has witnessed some radical changes in the characteristics of technology. These include increment in the costs of innovation, increasing significance of interdisciplinarity in technological areas, convergence of basic research with industrial application.

New facilitators such as technology transfer mechanisms, commercialisation bodies, incubators supported by public funding bodies, have emerged. The ecosystem in its entirety is experiencing a shift. Therefore, it is imperative to look at the context of how the institutions have to align themselves with the system and create enabling environment for innovation and entrepreneurship. In this regard, we investigated the literature and underwent some pilot studies in order to understand the enabling environment. This includes: (a) the understanding of various factors that are responsible for the development of an entrepreneurial ecosystem in a country through literature survey, (b) meeting and interviews with

the experts in the system. Eventually through an analysis of extensive literature survey we develop a list of factors that need to be analysed while studying or analysing the entrepreneurial ecosystem in a region.

2. Literature Review with related key concepts

2.1 The emergence of Knowledge Economy in context of Technology

The growth of knowledge is one of the central themes in the study of economic change. This concept traces its history back to the time when Romer (1986) suggested endogenous growth theory where knowledge was assumed to be an input in production process which has increasing marginal productivity rather than diminishing returns. Recent conceptualizations in innovation systems literature have focused on the importance of knowledge-based products in the markets. The newly implemented programs, and terms like Startup India, Make in India, Digital India drive us to study and understand the presence of knowledge based products in the sphere of the innovation systems.

A 'knowledge based economy' is a term used to describe the use of knowledge in production of goods and services. It requires individuals to have adaptive and creative thinking to develop solutions to societies' problems. In a knowledge economy, knowledge is considered as an economic good, i.e., a commodity (Cortright, 2001). It is due to the two main characteristics of knowledge: (1) Non-rival, that is, it can be used by as many users as desired, without being diminished in quantity or quality; (2) Non-excludable, that is, its consumption is available to all, and attempts to prevent consumption are generally ineffective.

Innovation systems are very knowledge intensive (Edquist, 1997). Though knowledge-based economies are also possible without technology (Amidon et al. 2005), but since we are interested on this term in context of technology based startups, we will restrict our discussion on technology based knowledge. According to Tornatzky et al. (1990), 'technology is a cognitive construct and does not find its existence without knowledge'. Technology also drives the innovation systems and has the potential of transforming them to their core. Therefore, discussing the concept of innovation requires an understanding of technology and its evolution. Therefore, it should be seen that basic research in science should be carried out by countries with their social, political, cultural and legal set-up in mind or these factors should be kept at priority in the process of evolution of technology.

2.2 The growth of Innovation Systems and their application in studies of Tech Startups

The characteristics of innovations have been changing since ever. At present they have turned into large complex systems wherein we witness coordination problems in addition to incentive problems due to increased 'scale of production' and 'scale of use'. This is particularly true for technological innovations due to the interactive nature of new technologies (in terms of standards, etc.). Moreover technological innovations have become more systemic today in two ways -- First their growth and sustenance requires increasingly large scale, complex R&D, manufacturing and marketing operations. Second, their usage and usefulness depend on an increasing number of other technological and non-technological factors. Using a systems approach in such a setup in studying innovation as a social phenomenon then becomes imperative.

Currently the studies in innovation systems are mainly oriented towards National Innovation Systems (NIS), Regional Innovation Systems (RIS), Sectoral Innovation Systems (SIS) and Technological Innovation Systems (TIS) (see Table 2). While the concept of NIS has its main focus on the 'nation' as the primary unit of analysis, the SIS is interested at a

specific ‘technical domain or industrial area’ for analysis. NIS also analyses the competitiveness of one national unit when with other national units. SIS develops an understanding of how knowledge is transferred, adopted and used for innovative work in different fields of industries irrespective of national or regional borders (see, e.g. Malerba, 2005). The concept of TIS is based on technology innovation diffusion and transformation into innovations relating to a ‘specific technology’ (Carlsson & Stankiewicz, 1991). Ylinenpää (2009) notes that the RIS has its foundations back in Marshall’s (1916) studies of Italian industrial districts, and regards the territorial aspect of innovation systems as crucial.

Table 1: Features of Innovation Systems

Framework	Unit of Analysis	Focus	Assumptions
NIS	Agents bounded within a nation (usually spread across and not just limited to a small region)	Learning and innovation, and the institutional bearing of learning and innovation; comparison of various units within a nation	(1) Knowledge is an important resource of economic growth (2) Learning takes place within social embodiments
RIS	Agents within small region (local region within a nation)	The interactions and relationships of economic, social, political and institutional agents that create a learning process	(1) Knowledge plays central role in innovation (2) Cooperation between actors is directly proportional to efficiency of the system
SIS	Technical domain or Industrial field (consisting of one or many technologies used in the domain)	<ul style="list-style-type: none"> • Interactions among agents for creation, development and diffusion of new sectoral products. • Systemic features in relation to knowledge and boundaries, heterogeneity of actors and networks, institutions and transformation through evolutionary processes 	
TIS	Specific technology (may be deployed and used in various areas of industry)	Technology innovation diffusion and transformation into innovations relating to a ‘specific technology	Technological innovation is positive, and will be adopted by a target population over time.

Source: Author’s construction

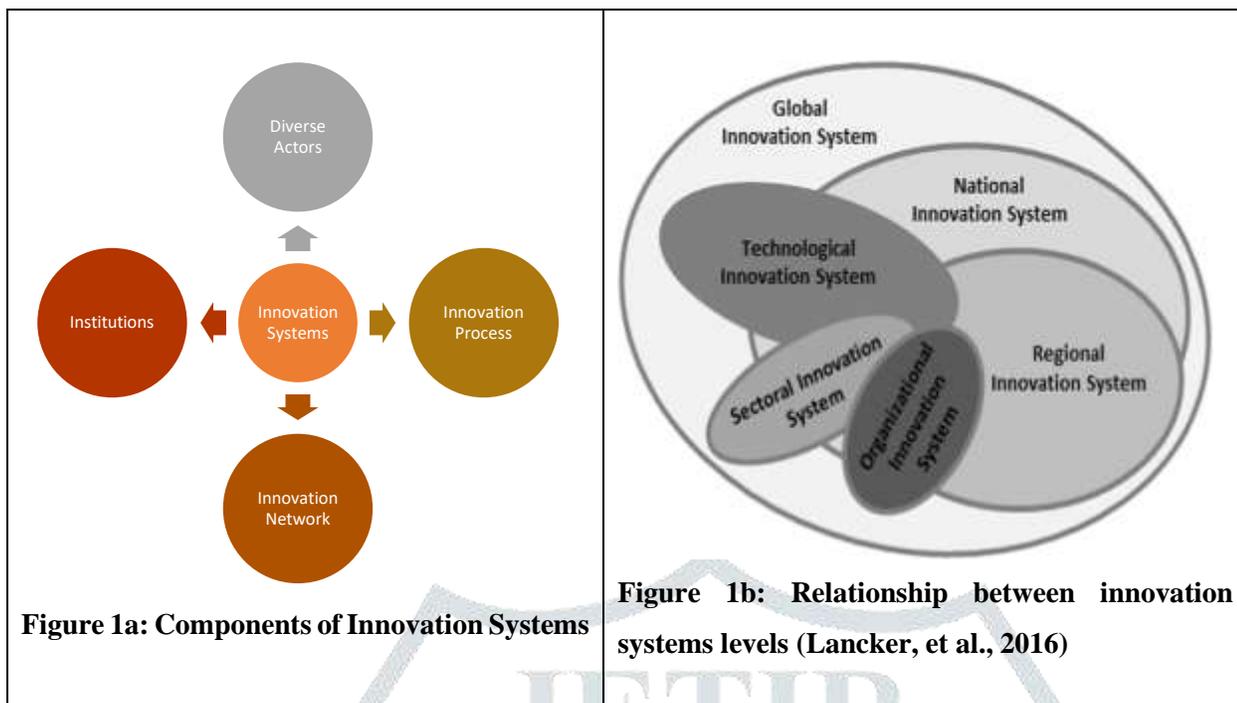
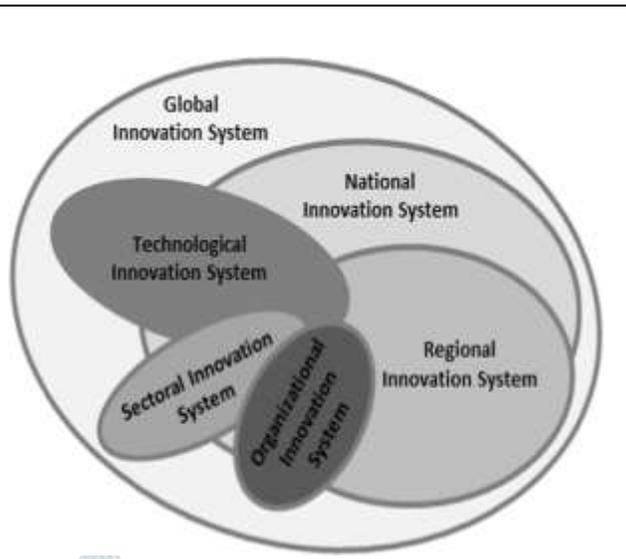


Figure 1b: Relationship between innovation systems levels (Lancker, et al., 2016)



Some major components of Innovation Systems are shown in Figure 1a. While discussing the concepts of innovation systems, discourses at national, sectoral, technological, and regional level are usually the focus of study. But not much attention is given to other systems such as corporate innovation system, which is an important view of innovation studies and should not be missed according to Patel and Pavitt (1995). A ‘corporate innovation system’ may be defined as ‘the set of actors, activities, resources and institutions and the causal interrelations that are in some sense important for the innovative performance of a corporation or a group of collaborating companies, including universities and other organizations’ (Granstrand, 2000). In another aspect, Lancker et al (2016) developed a framework for organisational innovation systems (OIS) wherein the primary unit of analysis is the ‘innovating organisation’ (Figure 1b). They elaborate upon the structural components of OIS in institutions, idea development, innovation network, commercialisation, and invention, and discuss the system failures related thereof.

2.3 The Understanding of Entrepreneurship and Entrepreneurial Ecosystem in a Knowledge Economy

The theoretical framework linking entrepreneurship and economic growth is provided by the new theories of industry evolution (Ericson and Pakes, 1995; Audretsch, 1995; Hopenhayn, 1992; Lambson, 1991 and Klepper, 1996). While traditional theories suggest that entrepreneurship will retard economic growth, these new theories suggest exactly the opposite – that entrepreneurship will stimulate and generate growth. The reason for these theoretical discrepancies lies in the context of the underlying theory. In the traditional theory, new knowledge plays no role; rather, static efficiency, determined largely by the ability to exhaust scale economies dictates growth. Joseph Schumpeter provided essential contributions in the field of economics, particularly those relating to innovation and entrepreneurship. He considered innovation as key driver of growth and competitiveness. His initial definition of ‘entrepreneur’ concerned only functions and activities related to innovation. The later theory by Schumpeter was less ‘individualistic’ (Sledzik, 2013), suggesting that ‘an entrepreneur’ could be a firm, an organisation, an association, or any entity, but not necessarily a person. Today’s knowledge-based economies are dependent on dynamic technological progress. The present generation of innovation no longer depends on individual personalities but involves the cooperation of many different actors. It has become widely

acknowledged that entrepreneurship is a vital force in the economies of developed countries. Richard Cantillon (early 1700s) considered an entrepreneur as ‘a specialist in taking on risk’ or a person who does not retreat from engaging in risky business ventures. Herbert and Link (1989) have identified three distinct intellectual traditions in the development of the entrepreneurship literature: German Tradition (Thiinen-Schumpeter), the Chicago Tradition (Knight-Schultz), and the Austrian Tradition (Mises-Kirzner-Shackle).

The Schumpeterian tradition has had the greatest impact on the contemporary entrepreneurship literature. In his 1911 classic treatise, *Theorie der wirtschaftlichen Entwicklung* (Theory of Economic Development), Schumpeter proposed a theory of *creative destruction*, where new firms with the entrepreneurial spirit displace less innovative incumbents, ultimately leading to a higher degree of economic growth. Further, Lundstrom and Stevenson (2001) followed the Global Entrepreneurship Monitor (GEM) study (Reynolds et al., 2000) and established entrepreneurship as ‘mainly people in the pre-startup, startup and early phases of business’. This approach confined the idea of entrepreneurship as a practice of startups only. The authors defend their emphasis on prestartup and startup by maintaining, ‘These are the targets for entrepreneurship policy measures and we propose that entrepreneurship policy measures are taken to stimulate individuals to behave more entrepreneurially. It is our position that this can be done by influencing motivation, opportunity and skill factors. Therefore, our aim is to see what types of policy actions are taken towards individuals in the pre- and early stages of idea and business development.’

There has been divergence in the thinking as well as the theories developed to study the factors affecting entrepreneurship especially in case of small firms. The conventional view suggested that the emergence of new firms is dependent of monetary incentives, meaning that a new firm enters the industry when existing firms earn greater than expected profits. These theories do not take into account the role of knowledge in the emergence of new firms, i.e., startups or spinoffs. The new theories are more dynamic in nature and take knowledge into account. They suggest that new firms also emerge on the expected value of new ideas. Entrepreneurs implement these ideas to capitalise the perceived potential of their knowledge which is actually divergent from what is pre-existing and is originated outside of the incumbent firms or the industry’s leaders. Table 2 suggests why growth of entrepreneurship is important for an economy by linking it with various aspects in the literature.

Table 2: Importance of Entrepreneurship with Links to Various Aspects

Links	Literature	Key Arguments
Entrepreneurship and Employment Generation	Birch (1981); Davis, Haltiwanger and Schuh (1996a, 1996b), Gallagher and Stewart (1986), Storey and Johnson (1987), Konings (1995), Heshmati (2001), Hohti (2000), Wagner (1995), Weigand and Audretsch (1999)	Small enterprises create most of the new jobs
Entrepreneurship and Growth and Survival	Mansfield (1962), Hall (1987), Dunne, Roberts and Samuelson (1989), Audretsch (1991), Wagner (1994), Tveteras and Edide (2000), Harhoff and Stahl (1995), Audretsch, Santarelli and Vivarelli (1999)	Likelihood of survival is positively related to firm size and age; Growth rates are higher for smaller enterprises
Entrepreneurship and Innovation	Kleinknecht (1987), Kleinknecht and Verspagen (1989), and Kleinknecht et al. (1991), Santarelli and Sterlacchini (1994), Scherer (1983), Bound et al. (1984), Schwalbach and Zimmermann (1991), Rothwell (1989), Link and Bozeman, 1991	The extent of informal R&D is considerable in Small firms
Entrepreneurship and Region	Audretsch and Fritsch (2002)	Regions with a higher startup rate exhibit higher growth rates
Entrepreneurship and Country	Audretsch and Keilbach	Growth of countries is positively associated with an entrepreneurial advantage
Entrepreneurship and Networking and Clusters	Porter (1990 and 2000); Saxenien (1994), Becattini (1990), Brusco (1990), Pyke and Sengenberger (1990)	New firms experience greater stability while in clusters or networks

2.4 Development of Entrepreneurial Ecosystem

Entrepreneurial ecosystems may be defined as ‘a set of interdependent actors and factors coordinated in such a way that they enable productive entrepreneurship within a particular territory’ (Stam and Spigel, 2016). The early understanding of Entrepreneurial Ecosystems was based more on the social, economic and cultural aspects of entrepreneurship shifting from the prevailing personality-based and more individualistic theories. (Dodd & Anderson, 2007). The literature on entrepreneurial ecosystems discusses the context of social, economic and cultural factors affecting entrepreneurship. This according to various scholars (Neck et al., 2004; Sternberg, 2007; Ylinenpää, 2009; Acs et al., 2014) is a connect between ‘innovation systems approach’ and ‘entrepreneurship studies’ and may be termed as ‘systems of entrepreneurship’.

Innovative and high growth startups are often an output of entrepreneurial activity (the process by which individuals create opportunities for innovation) which is in turn an output of entrepreneurial ecosystem (Stam, 2014). The entrepreneurship systems approach (ESA) diverges from innovation system approach (ISA) and market failure approach (MFA) in the sense that in ESA, the focus is on ‘entrepreneur’ rather than the ‘firm’, along with the emphasis on social and economic contexts linked to the entrepreneurial process. Sharing of non-codified knowledge, learning through cooperation and informal interactions are among the critical elements of innovation systems framework, and hence the

ISA is considered as a wide framework for policy formation. The major concern of this approach is the ‘system failure’, i.e., lack of sufficient elements in the system or inadequate interaction between them. Therefore, to some scholars like Stam (2015), ESA seems more desirable for development of policies for an entrepreneurial economy.

Isenberg (2010) also discusses the concept of the entrepreneurial ecosystem. He notes that there is no exact formula for the creation of such an ecosystem should follow nine principles when building an entrepreneurial ecosystem. These principles first emphasize the role of local conditions and bottom-up processes: (1) stop emulating Silicon Valley; (2) shape the ecosystem around local conditions; (3) engage the private sector from the start; (4) stress the roots of new ventures; (5) don’t over engineer clusters; help them grow organically. Second, they emphasize ambitious entrepreneurship: (6) favor the high potentials; (7) get a big win on the board. And third, focus on institutions: (8) tackle cultural change head-on; (9) reform legal, bureaucratic, and regulatory frameworks). Based on this, Isenberg (2011) formulates six distinct domains of the ecosystem: policy, finance, culture, support, human capital and markets. These largely overlap with the previously developed nine attributes and the eight pillars established by the World Economic Forum (2013) for a successful ecosystem (Figure 2).

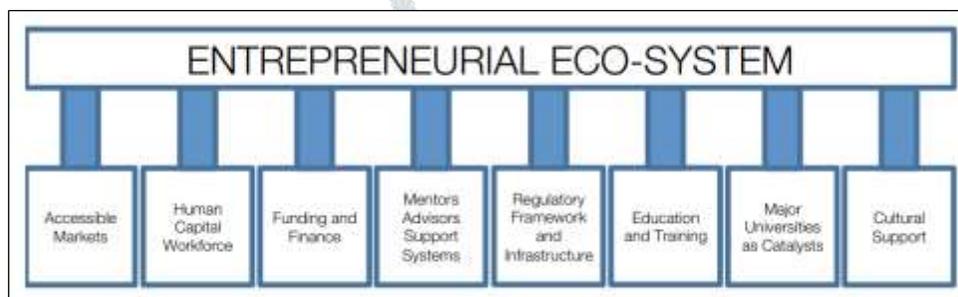


Figure 2: Eight Pillars of Entrepreneurial Ecosystem (World Economic Forum, 2013)

Spigel (2015) defines entrepreneurial ecosystems as ‘combinations of social, political, economic, and cultural elements within a region that support the development and growth of innovative startups and encourage nascent entrepreneurs and other actors to take the risks of starting, funding, and otherwise assisting high-risk ventures’. He groups these attributes into three categories- cultural, social, and material - cultural attributes (supportive culture and histories of entrepreneurship), social attributes (worker talent, investment capital, networks, mentors and role models), and material attributes (policies, universities, support services, infrastructure, open markets).

In another aspect of ecosystem studies, authors like Feld (2012) examine the replicability of systems like the Silicon Valley. They opine that the development of systems like Silicon Valley is a function of a large sequence of events and their series, and therefore, incubating one or a few aspects of such a complex series will not lead to a similar system in the results. However, other cases of successful ecosystems offer more reasonable approaches for policymakers. However according to Bala Subrahmanya (2017), technology startups have a tendency to grow well in a favourable entrepreneurial ecosystem. Even though the foundation of ecosystems in India such as those in Hyderabad and Bangalore may have been laid decades ago, they are seen as recent phenomena and providing a generally favourable environment for entrepreneurship to grow should help creating a conducive ecosystem. According to Bala Subrahmanya (2018), tech start-ups and ecosystems have even been emerging despite the absence of explicit policy support. But this does not imply an insignificant requirement of policy development. In line with Thurik et al. (2013), the next shift would be from

‘entrepreneurship policy’ to policy for an ‘entrepreneurial economy’, i.e. an entrepreneurial ecosystem. So the next phase of policy shall not be about maximising the quantity of entrepreneurship, but about creating an enabling ecosystem to focus on the quality entrepreneurship (Stam and Spigel, 2016).

The Table 3 shows the major clusters of factors that affect enabling environment for the entrepreneurship ecosystem (more specifically, the startup ecosystem). The factors in Table 3 have been observed through literature review and understanding of other empirical evidences, meeting and interviews with experts in the field. While going through the literature, it was found that various authors have set the importance of factors affecting the enabling environment. Some scholars are of the opinion that particular factors are more important than others. There is no priority order of factors in the present list as tabulated in Table-3 (Figure 5). It has been tried to produce a more exhaustive list of factors affecting the ecosystem than what is present in the existing literature.

Table 3: Factors affecting the enabling environment for the entrepreneurship ecosystem

Groups	Factors	References
Finance	Venture Capital	Ghisetti, et al, 2017; Canepa and Stoneman, 2008, Okrah and Nepp, 2017, Isenberg, 2011; World Economic Forum, 2013; GEI 2016; GEI 2017; GEM 2017-18
	Seed Funding	
	Angels	
	Bank Loans	
	Micro Finance Institutions	
	Crowdfunding	
	Govt. Finance	
	Tax Rates	
	Tax Incentives	
	Costs to start a Business	
Support Systems	Networks	Livramento and Foray, 2007; Isenberg, 2011; World Economic Forum, 2013; Mason and Brown, 2013; Stam, et al, 2009; Etzkowitz, 1998; Stam and Spigel 2016; OECD 2016
	Incubators	
	Legal Services	
	Business Mentors	
	Technical Advisors	
	Technology Transfer Institutions	
	Technology Business Incubators	
	Accelerators	
	Science Parks	
	Government Programs	
	Universities	
	Bureaucracy	
	Outsourcing Accessibility	
Research Culture		
Culture	Primary Education	Mason and Brown, 2013; World Economic Forum, 2013; Thurik and Dejardin, 2011; Isenberg
	Universities	
	Positive image of Entrepreneurship	

	Incentives	2011; Stam and Spigel 2016;
	Risk Capacity	Mason and Brown 2017;
	Awareness of success stories	Audretsch and Belitski 2017;
	Electricity	GEI 2016; GEI 2017; GEM 2017-18
Infrastructure	Transport	Audretsch, et al, 2015; Isenberg,
	Communication	2011; World Economic Forum,
	Water	2013; Stam and Spigel 2016;
	Educational Institutions	Mason and Brown 2017;
	Internet Access	Audretsch and Belitski 2017
Markets	Distribution Networks	Moore, 1993; Isenberg, 2011;
	Retail Networks	World Economic Forum, 2013;
	Marketing Networks	GEI 2016; GEI 2017; GEM
	Consumers	2017-18

Source: Author's construction

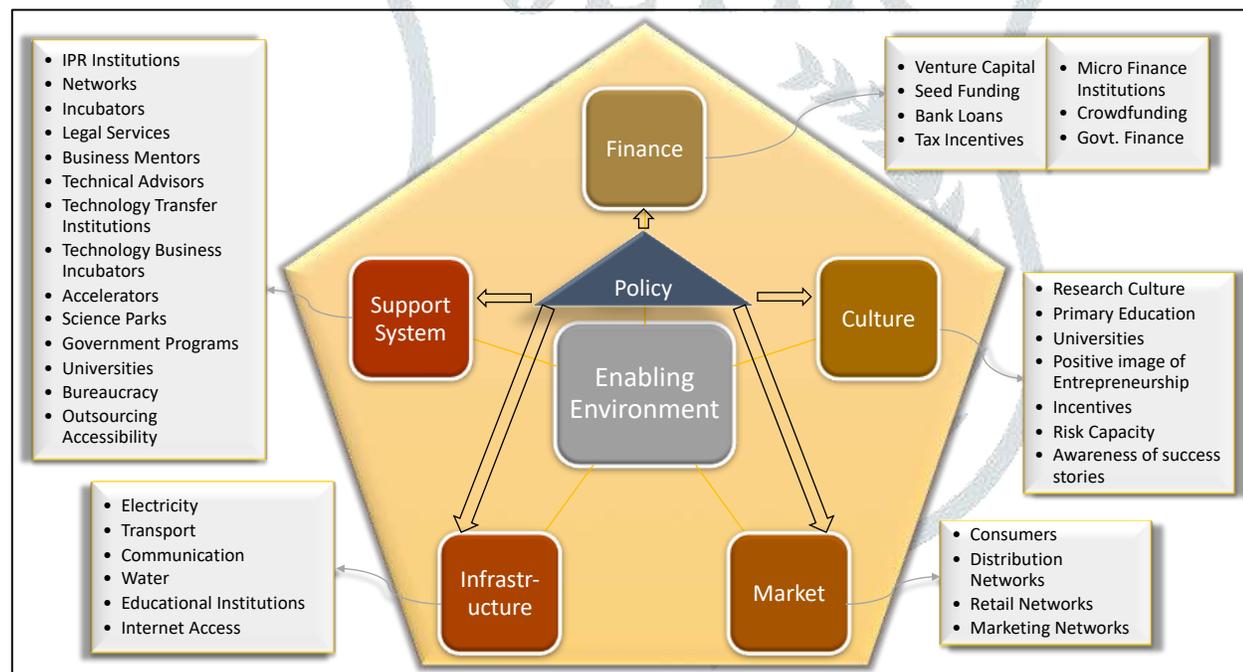


Figure 3: Framework for studying an Enabling Ecosystem for entrepreneurship in India

Source: Author's Construction

It is imperative for an enabling institution to take into account the presence of all these factors while developing a framework for sustainable growth of entrepreneurship in the target region.

3. Discussion

In order to understand the entrepreneurship ecosystem in a country it is imperative to study the enabling institutions for promoting innovations and entrepreneurship in the country. These institutions might be government bodies, private incubators, university entrepreneurship cells or might even be corporate firms. Different bodies enable the system in their own way. Some might target a sector while others might target a region. We can observe a strong policy shift

towards innovation-based growth in India during the last decade. Entrepreneurship is now promoted as a key driver of the innovation process. Important institutional structures, policies have evolved to create the innovation and entrepreneurship ecosystem. Visible impact is seen in terms of changes in institutions such as technology transfer mechanisms, commercialisation bodies, university incubators, government programs, etc. New facilitators such as incubators supported by public funding bodies have emerged. Institutions have been motivated to move towards entrepreneurship based systems. Ecosystem and support system mechanisms are experiencing a shift. These dynamic changes need to be empirically captured through theoretical lens for informed policy inputs.

In order to develop a robust and sustainable ecosystem of entrepreneurship in a region, institutions are believed to perform an instrumental role, and the evolutionary nature of institutions is equally important for improving the environment for entrepreneurship. Enterprises are important, but they play a limited role in fiscal investments in a larger context. Moreover, big enterprises are more likely to develop their own institutional environment as an adjustment strategy according to the regional economic system. On the other side, Small and Medium Enterprises (SMEs) that are major contributors of innovation are more inclined towards exploiting the regional entrepreneurship environment and are influenced by the same. Therefore, the institutions in order to develop a better entrepreneurship environment, should work towards improving all the variables as listed in this study. But improving all the constraints or indicators at once is not viable. Therefore, attempts should be towards improving the binding institutional barriers, the worst performing indicators or variables. An improvement in one variable would affect the other variable, thus creating an exponential rise in the quality of entrepreneurial environment in the region.

***Acknowledgements:** The Author also thanks his PhD supervisor Prof. Sujit Bhattacharya his valuable support. The Author thanks Council of Scientific and Industrial Research for providing CSIR-JRF Fellowship to carry out this research.*

References:

- Acs, Z. J., Autio, E., Szerb, L. (2014). National Systems of Entrepreneurship: Measurement Issues and Policy Implications. *Research Policy*, 43(3), 476–449.
- Acs, Z. J., Audretsch, D. B. (2005). *Entrepreneurship, Innovation and technology Change*. Now Publication.
- Amidon, D., Formica, P., Mercier-Laurent, E. (eds.) (2005), *Knowledge Economics: Emerging Principles, Practices and Policies*. Tartu, Estonia: Tartu University Press.
- Audretsch, D. B. (1991). New Firm Survival and the Technological Regime. *Review of Economics and Statistics*, 73 (03), August, 441-450.
- Audretsch, D. B. (1995). *Innovation and Industry Evolution*. Cambridge: MIT Press.
- Audretsch, D. B. and Belitski, M. (2017), Entrepreneurial ecosystems in cities: establishing the framework conditions. *The Journal of Technology Transfer*, 42(5), 1030-1051.
- Audretsch, D. B. and Fritsch, M. (2002), Growth Regimes over Time and Space. *Regional Studies*, 36(2), 113-124.

- Audretsch, D. B., Heger, D., Veith, T. (2015). Infrastructure and Entrepreneurship. *Small Business Economics*, 44(2), 219-230.
- Audretsch D.B. and Keilbach M. (yyyy). Entrepreneurship, Growth and Restructuring, Discussion papers on Entrepreneurship, Growth and Public Policy, no. 1306, Max Planck Institute of Economics
- Audretsch,, D. B., Santarelli E. and Vivarelli, M. (1999). *Start-up Size and Industrial Dynamics: Some Evidence from Italian Manufacturing*. *International Journal of Industrial Organization*, 17, 965-983.
- Bala Subrahmanya M. H. (2017). Comparing the Entrepreneurial Ecosystems for Technology Startups in Bangalore and Hyderabad, India. *Technology Innovation Management Review*.
- Bala Subrahmanya M. H. (2018). How Distinct are Technology-Based Start-Ups in India? Features, Policies and Evolving Ecosystems. *Asian Journal of Innovation and Policy*, 7 (1), 30-54.
- Becattini G. (1990). The Marshallian Industrial District as a Socio-Economic Notion. In: G. Becattini, F. Pyke and W. Sengenberger, 1990, *Industrial Districts and Inter Firm Co-operation in Italy*, Geneva: International Labour Studies, 37-51.
- Birch, D. L. (yyyy). Who Creates Jobs?. *The Public Interest*, 65.
- Bound J., Cummins C., Griliches Z., Hall B. H., Jaffe A. (1981). Who Does R&D and Who Patents?. In: Z. Griliches (ed.), *R&D, Patents, and Productivity*, Chicago, IL: University of Chicago Press, 21-54.
- Brusco, S. (1990). *The Idea of the Industrial District: Its Genesis*. In: G. Becattini, F. Pyke and W. Sengenberger, *Industrial Districts and Inter-Firm Cooperation in Italy*, Geneva: International Labour Studies, 10-19.
- Canepa, A., Stoneman, P. (2008). Financial constraints to innovation in the UK: evidence from CIS2 and CIS3. *Oxford Economic Papers*, 60(4), 711–730.
- Carlsson, B., Stankiewicz, R. (1991). On the nature, function and composition of technological systems. *Journal of Evolutionary Economics*, 1(2), 93–118.
- Cortright, J. (2001). *New Growth Theory, Technology and Learning: A Practitioner's Guide*. *Reviews of Economic Development Literature and Practice No. 4*, US Economic Development Administration, Washington DC.
- Davis, S. J., Haltiwanger, J. C., Schuh, S. (1996a) *Job Creation and Destruction*. Cambridge: MIT Press.
- Davis, S. J., Haltiwanger, J. C., Schuh, S. (1996b) *Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts*. *Small Business Economics*, 8(4), 297-315.
- Dodd, S. D., Anderson, A. R., Mumpsimus and the Mything of the Individualistic Entrepreneur. *International Small Business Journal*, 25, 341-360.
- Dunne, T., Roberts, M.J., Samuelson, L. (1989). The Growth and Failure of U.S. Manufacturing Plants. *Quarterly Journal of Economics*, 104, 671-698.
- Edquist C. (1997). *Systems of Innovation: Technologies, Institutions and Organizations*. Routledge.
- Ericson, R., Pakes, A. (1995). Markov-Perfect Industry Dynamics: A Framework for Empirical Work. *Review of Economic Studies*, 62, 53-82.
- Etzkowitz, H. (1998). The norms of entrepreneurial science: cognitive effects of the new university–industry linkages. *Research Policy*, 27(8), 823-833.
- Feld B. (2012). *Startup Communities: Building an Entrepreneurial Ecosystem in Your City*. New York: Wiley.
- Gallagher, C., Stewart, H. (1986). Jobs and the Business Life-cycle in the U.K. *Applied Economics*, 18, 875-900.

- Ghisetti, C., Mancinelli, S., Mazzanti, M., Zoli, M. (2017). Financial barriers and environmental innovations: evidence from EU manufacturing firms. *Climate Policy*, 17, S131-S147.
- Granstrand, O. (2000). Corporate Innovation Systems: A Comparative Study of Multi-Technology Corporations in Japan, Sweden and the USA. *Paper submitted to the Dynacom project*.
- Hall, B. H. (1987). The Relationship between Firm Size and Firm Growth in the U.S. Manufacturing Sector. *Journal of Industrial Economics*, 35, 583-605.
- Harhoff, D., Stahl, K., Woywode, M. (1998). Legal Form, Growth and Exit of West- German Firms: Empirical Results for Manufacturing, Construction, Trade and Service Industries. *Journal of Industrial Organization*, 46, 453-488.
- Hebert, R. F., Link, A. N. (1989). In Search of the Meaning of Entrepreneurship. *Small Business Economics*, 1(1), 39-49.
- Heller, M. A., Eisenberg, R.S. (1998). Can Patents Deter Innovation? The Anticommons in Biomedical Research. *Science*, 280(5364), 698-701.
- Heshmati, A. (2001). On the Growth of Micro and Small Firms: Evidence from Sweden. *Small Business Economics*, 17(3), 213-228.
- Hohti, S. (2000). Job Flows and Job Quality by Establishment Size in the Finnish Manufacturing Sector, 1980-1994. *Small Business Economics*, 15(4), 265-281.
- Hopenhayn, H. A. (1992). Entry, Exit and Firm Dynamics in Long Run Equilibrium. *Econometrica*, 60, 1127-1150.
- Isenberg, D. J. (2010). How to Start an Entrepreneurial Revolution. *Harvard Business Review*, 88(6), 41-50.
- Isenberg, D.J. (2011). Introducing the Entrepreneurship Ecosystem: Four Defining Characteristics. *Forbes*.
<http://www.forbes.com/sites/danisenberg/2011/05/25/introducing-the-entrepreneurship-ecosystem-four-defining-characteristics>
- Klepper, S. (1996). Entry, Exit, Growth, and Innovation over the Product Life Cycle. *American Economic Review*, 86(3), 562-583.
- Konings, J. (1995). Gross Job Flows and the Evolution of Size in U.K. Establishments. *Small Business Economics*, 7, 213-220.
- Krahmer, F. M. (2005). Science-based Technologies and Interdisciplinarity: Challenges for Firms and Policy. In: "Systems of Innovation" by Charles Edquist, Roulledge.
- Lambson, V. E. (1991). Industry Evolution with Sunk Costs and Uncertain Market Conditions. *International Journal of Industrial Organization*, 9, 171-196.
- Lancker, J. V., Mondelaers, K., Wauters, E., and Huylenbroeck, G. V. (2016). The Organizational Innovation System: A systemic framework for radical innovation at the organizational level. *Technovation*, 52–53, 40-50.
- Link, A. N., Bozeman B. (1991). Innovative Behavior in Small-Sized Firms. *Small Business Economics*, 3(3), 179-184.
- Livramento, I. and Foray, D. (2007). Does IPR protection affect high growth entrepreneurship? A cross-country empirical examination. *EPFL-CDM-CEMI working draft*.
- Lundstrom, A., Stevenson, L. (2001). Entrepreneurship Policy for the Future", *Stockholm: Swedish Foundation for Small Business Research*.
- Mansfield, E. (1962). Entry, Gibrat's Law, Innovation, and the Growth of Firms. *American Economic Review*, 52(5), 1023-1051.

- Mason, C., Brown, R. (2013). Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship. *OECD LEED Programme*.
- Moore, J. (1993). Predators and Prey: A New Ecology of Competition. *Harvard Business Review*.
- Neck, H. M., Meyer, G. D., Cohen, B., Corbett, A. C. (2004). An entrepreneurial system view of new venture creation. *Journal of Small Business Management*, 42(2), 190-208.
- OECD (2016). *Start-up in Latin America 2016*. <http://www.oecd.org/dev/americas/startup-latin-america.htm>
- Okrah, J., Nepp, A. (2017). Factors Affecting Startup Innovations and Growth. *International Journal of Business Management and Leadership*, 8(1), 11-21.
- Patel, P., Pavitt, K. (1995). Technological Competencies in the World's Largest Firms: Characteristics, Constraints and Scope for Managerial Choice. *IIASA Working Paper WP-95-066*, International Institute for Applied Systems Analysis.
- Porter, M. (1990). *The Comparative Advantage of Nations*. New York: Free Press.
- Porter, M. (2000). Clusters and Government Policy. *Wirtschaftspolitische Blätter*, 47(2), 144-154.
- Pyke, F., Sengenberger, W. (1990). Introduction. In: Pyke, F., Becattini, G., and Sengenberger, W. (eds.) *Industrial Districts and Inter-Firm Co-Operation in Italy*, Geneva: International Institute for Labour Studies, 1-9.
- Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94(4), 1002-1037.
- Rothwell, R. (1989). Small Firms, Innovation and Industrial Change. *Small Business Economics*, 1(1), 51-64.
- Santarelli, E., Sterlacchini, A. (1994). New Firm Formation in Italian Industry, 1985-1989. *Small Business Economics*, 6(2), 95-106.
- Scherer, F. M. (1983). The Propensity to Patent. *International Journal of Industrial Organization*, 1, 107-128.
- Schwalbach, J., Zimmermann, K. F. (1991). A Poisson Model of Patenting and Firm Structure in Germany. In: Zoltan, J., Acs and Audretsch D.B. (eds.). *Innovation and Technological Change: An International Comparison*, Ann Arbor: University of Michigan Press
- Sledzik, K. (2013). *Schumpeter's View on Innovation and Entrepreneurship*.
- Smith, D. K., Alexander, B. C. (1988). *Fumbling the Future: How Xerox Invented, the Ignored, the First Personal Computer*. New York: William Morrow.
- Spigel, B. (2015). The Relational Organization of Entrepreneurial Ecosystems. *Entrepreneurship Theory and Practice*, 41(1).
- Stam, E. (2014). *The Dutch Entrepreneurial Ecosystem*. <http://dx.doi.org/10.2139/ssrn.2473475>, 2014
- Stam, E. (2015). Entrepreneurial Ecosystems and Regional Policy: A Sympathetic Critique. *European Planning Studies*, 23(9), 1759-1769.
- Stam, E. and Spigel, B. (2016). Entrepreneurial Ecosystems. *U.S.E. Discussion Paper Series: 16-13*, Utrecht University.
- Stam, E., Suddle, K., Hessels, J., Stel, A. (2009). High-Growth Entrepreneurs, Public Policies, and Economic Growth. In: Baptista, R., Leitao, J. (eds.). *Public Policies for Fostering Entrepreneurship*. International Studies in Entrepreneurship, Vol 22. Springer, New York.
- Sternberg, R. (2007). Entrepreneurship, Proximity and Regional Innovation Systems. *Tijdschrift voor Economische en Sociale Geografie*, 98(5), 652-666.
- Storey, D. J., Johnson, S. (1987). *Job Generation and Labour Market Change*. London: MacMillan.
- Thurik, R., Dejardin, M. (2011). The Impact of Culture on Entrepreneurship. *The European Business Review*, 57-59.

- Thurik, R., Stam, E., Audretsch, D. B. (2013). The Rise of the Entrepreneurial Economy and the Future of Dynamic Capitalism. *Technovation*, 33(8-9) 302-310.
- Tornatzky, L. G., Fleischer, M. (1990). *The Process of Technological Innovation*. Lexington Books.
- Tveteras, R., Eide, T. E. (2000). Survival of New Plants in Different Industry Environments in Norwegian Manufacturing: A Semi-Proportional Cox Model Approach. *Small Business Economics*, 14(1), 65-82.
- Wagner, J. (1994). Small Firm Entry in Manufacturing Industries: Lower Saxony, 1979-1989. *Small Business Economics*, 6(3), 211-224.
- Wagner, J. (1995). Firm Size and Job Creation in Germany. *Small Business Economics*, 7(6), 469-474.
- Weigand, J., Audretsch, D. B. (1999). Does Science Make a Difference? Investment, Finance and Corporate Governance in German Industries. *Discussion Paper 99-1, Institute for Development Strategies*, Indiana University.
- World Economic Forum (2013). *Entrepreneurial Ecosystems around the Globe and Company Growth Dynamics*. Report Summary for the Annual Meeting of the New Champions 2013.
- Ylinenpää, H., Entrepreneurship and Innovation Systems: Towards a Development of the ERIS/IRIS Concept. *European Planning Studies*, 17(8), 1153-1170.

