

Editorial: Entrepreneurial Ecosystems for Tech Start-Ups in India and Japan II

Takao Fujiwara^{*}, M H Bala Subrahmanya^{}**

Entrepreneurship of high-tech start-up and its ecosystem creation have been worldwide topics for the past 40 years since the great success of Silicon Valley. We have observed industrial renewal from past textile, steel, and shipbuilding to ICT, biotech, and nanotech industries, and also generation changes of main firm players in each industry. Start-up firms are generally better at combining innovative technology and niche market in cost, speed, and flexibility than big corporations, which are oriented toward large markets. Then, start-up firms play the role of matchmakers between the basic research stage at universities and the manufacturing and selling stages at large corporations. However, they face the 'Valley of Death' phenomenon with initial negative profits period due to managerial resources constrain and many innovation births and deaths in the start-up ecosystem. In some sense, a high-tech start-up ecosystem such as Silicon Valley can historically expect radical innovation, but also inefficiencies and a wasteful innovation creating system.

On the other hand, the automotive subcontracting system as Toyota, in Japan, seems to be famous at incremental improvement rather than radical innovation, although it is characterized by a more vertical hierarchy when it comes to order technological development and manufacturing of each auto-parts to subcontractors at first tier or lower tiers. Maybe a third way seems to be a more reasonable innovation system between Silicon Valley and Toyota Subcontracting System in technological and economic efficiency.

Furthermore, Bangalore, Hyderabad, and Gurgaon are famous high-tech clusters in India, something very old, but at the same very young for a growing country. India is very aggressive when it comes to the rise of start-up companies like US, the UK and Israel. For example, the CEOs of Google, Microsoft, Adobe, and SanDisc are Indians, and the human connection between Bangalore and Silicon Valley is very close regardless of physical distance. Many young engineers are going to the US and Europe after finishing IIT and IIS undergraduate degrees, and receive PhDs as well as engineering

^{*} Institute of Liberal Arts and Sciences, Toyohashi University of Technology, 1-1 Hibarigaoka, Tenpaku, Toyohashi, Aichi 441-8580, Japan; fujiwara@las.tut.ac.jp

^{**} Department of Management Studies, Indian Institute of Science, Bangalore, 560012, India; bala@iisc.ac.in

and managerial positions at high-tech clusters at Silicon Valley, La Jolla, and Boston. Infosys and Wipro are now independent and established ICT companies after being subcontractors of large US and European companies in India. Flipkart and Snapdeal are presently key players in the new generation of ICT start-ups.

By the way, Toyohashi University of Technology (TUT) and Indian Institute of Science (IISc) held the 2019 JSPS-ICSSR Joint Seminar in August 21-25, 2019 at TUT, after organizing last year's identical IISc seminar in Bangalore. Except for small conferences, this seminar offered visitor tours to Hamamatsu Photonics Central Laboratory, Armonicos, and Hamamatsu Startup in Hamamatsu, on August 23, and to Toyota Factory and Toyota City Tech-shop, Sentan in Toyota City on August 24. It also organized an excursion to the Toyota Commemorative Museum of Industry and Technology and the Atsuta Shrine, on August 25. Hamamatsu is considered Japan's 'Silicon Valley' because many global companies like Toyota, Honda, Suzuki, Yamaha, and Hamamatsu Photonics were founded here.

We had two days of discussion at the conference in August 21-22, where seven TUT delegates and seven IISc delegates made presentations in addition to both teams' introductory and concluding remarks. We selected for inclusion in this special issue, four papers from each teams.

In this issue, the first IISc paper, written by Rashmeet Singh and MH Bala Subrahmanya, explore statistically the relationships between Network, Internationalization, Innovation, and Sales Turnover in SME engineering manufactures in Bangalore. Based on Karnataka data, the main interactions are focused on the supply chain. But the authors found statistical relationships between Network and Innovation, between Export Intensity and Network, and between Export Intensity and Innovation. The authors also confirmed the relationship between Sales Turnover with not only Network and Innovation, but also Export Intensity. This paper shows the competitive improvement not only of famous software start-ups, but also of engineering SMEs in Bangalore's industrial cluster.

The second paper, written by MH Bala Subrahmanya and Arun Kumar Gopaldaswamy, presents a case study about the university-based start-up ecosystem related to IIT Madras (IITM), Chennai, through semi-structured interviews with key players such as the Dean of Industrial Consultancy & Sponsored Research (Academic Entrepreneur), CEO of Incubation Centre (IC) and Rural Technology Business Incubator (RTBI), Associate Faculty-in-charge, Nirmaan (Pre-incubation Cell), Student Office to Centre for Innovation (CFI or Sand Box), and two founders. Main entrants to IC are Student-led start-ups from CFI, Spin-offs from faculty labs through Nirmaan, and Outsiders as Alumni and Industry Personnel. IC as core center is located in the Research Park and includes RTBI, Biotech TBI (Technology Business

Incubator) and Medical TBI with Corporate Clients. As of 2017, there are 140 incubatees; successful cases are shown during a short period of just ten years.

The third paper, written by HS Krishna, is a descriptive policy comparison between India and China, regarding High-tech Start-up Ecosystem. This paper notes that there is no big difference in pathways of two countries' policy with the US and Israel except historical start lines from the macro-level perspective. The paper is using Professor MH Bala Subrahmanya's framework as Mandala, focusing on the five main functions as Finance, Market, Human Resources, Mentorship and Support System surrounding main three players as Academia, Government, and Industry. A comparison of finance indicates that India has some challenges at seed and early stage funding, but China has a more mature system covering all stages. As to talent immigration, India has experienced a huge inflow of expatriates due to the country's high-tech entrepreneurship, and China has emphasized the rich incentive initiatives offered to skilled overseas Chinese.

The final IISc paper, written by Kshitija Joshi and Deepak Chandrashekar, deals with the IPO and M&A Exit and information asymmetry between Venture Capital (VC) and Entrepreneurial Founders from an agency risk perspective. Based on IPO and M&A Exit data, this paper found IPO/M&A as dependent variable is negatively correlated with the Early Stage Founding and the Social VC, and positively correlated with High-Tech Focus, Age of VC Firm, and Syndicated Deals by using logistic regression. Foreign VC Firms, especially, have a tendency to be more successful for both IPO and M&A. Then, they prefer a late stage, M&A, inside Bangalore, and Syndications for risk mitigation compared with domestic VC Firms more familiar with target start-up firms.

The TUT team's first paper, written by Yoji Nakajima, Shuto Miyashita, and Shintaro Sengoku, examines three long-term cases of university spin-offs linking university research and start-up though dual-role venture capitalists who understand both university labs and target start-ups. The authors select three cases from 30 representative national projects in the FIRST Program. Usually, there is a big gap between the academic article production stage and industrial patent filing. This paper focuses on key Venture Capitalists who deeply understand and experience university research and also the MBA knowledge/skill. This paper especially emphasizes the role of long-term escort by academic entrepreneurial venture capitalist (EP-VCist) through exclusive licence contract.

The second paper, written by Katsunori Kume and Takao Fujiwara, explores the optimal capacity investment decision between seasonal demand variation and the flexible capacity management option for facility or tentative manpower in the supply chain subcontractor in the beverage industry. There is a big gap between demand upper/lower limits and average manufacturing capacity. For

example, suppliers sometimes experience an opportunity loss in the summer due to inadequate manufacturing capacity, and a surplus capacity in the winter. The authors apply the SARIMA model for demand forecasting and the Bermudan Option, additional manpower and American option, and manufacturing facility by simulation analysis for risk management. They found mixed options model gives the best result.

The third paper, written by Wanli Cai, examines intellectual property as an important topic for the innovation and entrepreneurial start-up ecosystem. This paper focuses on a specific case study to analyze the formation and development process of the doctrine of equivalents and indirect infringement theory in Japan, because the Japanese Patent Law does not adopt the doctrine of equivalents nor has any provisions about equivalent infringement to prevent a gray zone as imitation by partial modification against a protected whole product. That is, the Supreme Court of Japan has recognized the doctrine, but provided five strict requirements on the application. Then, many cases failed to satisfy even the first requirement out of the five, except in very limited situations. China only provides the means-function-result like the US. This paper insists on all steps of idea-way-result.

The fourth paper, written by Takao Fujiwara, examines R&D (Research and Development) investment sustainability of biotech start-ups, especially in a financial risk condition as Lehman Brothers' bankruptcy. Biotech start-ups are uniquely facing the 'Valley of Death' phenomenon as a long-term and deep negative profits period, reflecting the high-risk high-return business condition, with the majority of them being in deficit condition. This paper compared positive profits biotech firms and negative profits biotech firms between FY2008 and FY2016, with comparable data from big pharmaceutical corporations as benchmark. The database is from US SEC EDGAR and methodologies are real options and Bayesian MCMC (Markov chain Monte Carlo) analysis. Findings point to the fact that Total Stockholders' Equity as growth option can provide continual support.

Overall, IISc team members' papers are based on India's or Bangalore's experimental study, conceptual theory, and policy perspective research. Their papers are sophisticated and benefitted from the supervision by Professor MH Bala Sunbrahmnya. The TUT team's papers offer a greater variety in content. Associate Professor Sengoku is a faculty member of Tokyo Institute of Technology and a government committee member for science and technology. Dr. Kume is executive officer at his manufacturing company. Professor Cai is lecturer in intellectual property at TUT. Professor Fujiwara is a faculty for management of technology at TUT. However, not only seminar discussions, but also set of papers are a useful method for exchanging ideas between India and Japan.