

## Technological Innovation in Indian SMEs: Need, Status and Policy Imperatives

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### Abstract

SMEs, due to their unique characteristics, are found to have inherent capabilities to undertake technological innovations successfully across industries and nations. While there is considerable empirical evidence to throw light on SME innovation contributions in the context of developed countries, there is hardly any evidence to reveal how innovative SMEs are in rapidly industrializing economies like India. This paper reveals the core findings of two empirical “Innovation Projects” implemented in the previous decade in Bangalore, the globally known high-tech city of India. Indian SMEs are largely incremental innovators, prompted by their customers and involved in product and/or process innovations. But majority carried out innovations with internal efforts only whereas the minority which obtained external support, had better technical strength, indulged in more frequent and both product & process innovations. Such SMEs achieved better innovation performance as well as better economic performance. Some of them internationalized themselves in the process. However such achievements are “an oasis” in the vast Indian SME sector. How to promote (i) innovations, (ii) quality of innovations and (iii) patenting culture among the SMEs is a challenge for Indian Policy Makers. The paper concludes with proposing some policy recommendations in this direction.

**Key Words:** Technological innovation, SMEs, Policy support, Bangalore, India

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### 1.- Technological Innovation and SMEs: Significance of Relationship

Small & Medium Enterprises (SMEs) have been considered one of the driving forces of modern economies due to their multi-faceted contributions in terms of employment, exports and technological innovations, among others. Among its contributions, its ability to innovate assumes significance because in modern economic thinking, innovation is ascribed a central role in the evolution of industries. Technological innovation is a key factor in a firm’s competitiveness and it is unavoidable for firms which want to develop and maintain a competitive advantage and/or gain entry in to new markets (Becheikh, et.al. 2006).

Technological innovation has the potential to spur growth of individual enterprises at the micro level and give a new dimension to industry growth at the macro level. They offer a major explanation for why growth rates at the firm, regional or national level differ. Therefore, technological innovation is at the heart of economic change. Technological innovation is the ultimate source of productivity and growth. It is the only proven way for economies to consistently get ahead (Solow, 1987).

Technological innovation has been defined in different ways in different contexts. In the context of a developing country, it is defined as the process by which firms master and implement the design and production of goods and services that are new to them irrespective of whether they are new to their competitors, their customers or the world (Mytelka, 2000). It is a process or product that is new to the economy of a particular developing country, regardless of whether it has been used before elsewhere. But the most widely quoted definition is that of OECD (1997): “implemented technologically new products and processes and significant technological improvements in products and processes”. However both the definitions bring out the importance of introducing a new or improved product or process which can give a new direction to the growth of a firm, industry or economy.

Among firms of different sizes, SMEs including start-ups, across industries and economies have the unrealized innovation potential (Chaminade and Van-Lauridsen, 2006). This is primarily attributed to their inherent characteristics such as flexibility, better adaptability and receptivity, effective internal communication, simple organizational structure, quick decision making, etc. (Harrison and Watson, 1998). There is substantial empirical evidence to show that a number of SMEs in a wide variety of sectors across countries do engage in technological innovations, and that these innovations are likely to be an important determinant of their success (Hoffman, et.al., 1998).

Many of the new technologies and industries seen as critical to U.S. economic growth are closely identified with small and medium businesses, that is, those employing fewer than 500 employees. According to Longnecker, et al (2000), 50% of all innovations and 94% of all radical innovations in the USA since World War II have come from new, small firms. In advanced countries, SMEs are promoted as the “seed bed of innovations”, among others. However the ability and innovative capacity of SMEs varies significantly depending on their sector, size, focus, resources, regions and the business environment in which they operate (Burrone and Jaiya, 2005). It is in this backdrop that we attempt to throw light on the status and achievements of SME innovations in India and the policy imperatives for promoting innovations in the Indian SME sector. SME sector in India employs 60 million persons (approximately 15% of India’s workforce) through 26 million enterprises, contributes 45% of the manufactured output, 40% of total exports and 8% of the Gross Domestic Product (Ministry of MSMEs, 2012).

## **2.- Technological Innovation in Indian SMEs: Current Status and Achievements**

There are three relevant questions with respect to Indian SMEs. First and foremost, it is important to know whether at all, Indian SMEs are technologically innovative. Secondly, if yes, to what extent? Thirdly, what is the nature of their innovations and what are their achievements? These questions assume significance because India has not yet gained international attention for its industrial innovations, leave alone SME innovation, unlike it has gained attention for its relatively high rate of economic growth in the global economy.

There was hardly any major empirical investigation undertaken in India prior to the 1990s, to understand the nature and extent of technological innovations of SMEs (Bala Subrahmanya, et al, 2001). Recently, two of the first major empirical research projects were carried out by us at the Indian Institute of Science, Bangalore (Bala Subrahmanya, et al, 2001; Bala Subrahmanya, et al, 2008) sponsored by the Department of Science and Technology, Government of India, New Delhi. The first one focused on Research & Development and innovations carried out by SMEs in Karnataka state (including Bangalore) as a whole. The second research project focused on the influence of technological innovations on the growth of manufacturing SMEs in three industrial sectors (auto components, electronics and machine tools) of Bangalore, capital city of Karnataka. Both gathered primary data. But the former project was confined to one particular year (1999/00) and covered every possible SME in the state amounting to a total of 2058 SMEs, thus it was virtually a Cen-

sus, whereas the latter project gathered primary data for a consecutive period of five years (from 2001/02 to 2005/06) from a total sample of 214 SMEs. The former clearly revealed that Bangalore is the “innovation hub” of Karnataka.

Both the research projects though implemented with a gap of five years, brought out similar results. Indian SMEs by and large carried out only incremental technological innovations. Most of the innovative SMEs initiated technological innovations due to customer pressure and product innovations were largely confined to changing product designs/shapes/dimensions to suit customer requirements. Alternatively, process changes involved raw material replacement, among others, to achieve cost reduction or quality improvement or both. Overall, enhancing firm level competitiveness was the major objective of SME innovations in India.

How these SMEs have implemented technological innovations is another pertinent issue. SMEs in general face innumerable constraints for undertaking innovations - of them the most prominent one is technical capability. Even where SMEs have some internal technical competence, they often find the need for external support. However, a majority of SMEs has carried out innovations only with internal efforts. This could be due to their lack of internal technical strength or involvement in very limited or occasional innovations. In both cases, they would hardly scout for or be able to convince and obtain external support. Those SMEs which have obtained external support were found to be having better internal technical competence characterized by technically qualified entrepreneur and exclusive in-house design centre. Such SMEs carried out innovations more frequently, involving both products and processes. All these indicated that SMEs should have internal technical capability and greater need for external support in the form of comprehensive (both product and process) innovations and more frequent innovations, only then they look for and obtain external support. What is significant to note is that SMEs which have obtained external support produced better innovation performance in the form of a larger share of innovated products in total sales.

Another major determinant of SME innovation performance was the causal factor of its origin. Broadly, SMEs can be classified into two groups: (i) Entrepreneurial firms, and (ii) Salary-substitute firms. The former emerged as a start-up to implement the innovative ideas of an entrepreneur or to exploit the identified market opportunities whereas the latter came up mainly as a means of employment by taking advantage of government sponsored incentives and sometimes due to the assured market from a large firm. We found that entrepreneurial firms have produced better innovation performance than salary-substitute firms.

Ultimately, the form of organization matters. A predominantly large number of SMEs was either a proprietorship concern or a partnership firm and a few were private limited companies. Individual proprietorship firms did not achieve innovation performance as much as partnership or private limited firms. This could be because an individual is no match for the “pool of resources” provided by a group of owner promoters.

It is significant to note that SMEs which have achieved better innovation performance have achieved better economic performance in the form of higher growth of sales turnover over a period of time. Here too entrepreneurial firms scored over salary-substitute firms. Further, younger firms grew faster than older firms. This could be because, as Dobbs and Hamilton (2007) observed, new firms tend to grow quickly upon start-up but this tends to stop once a firm has reached a sufficient scale. Finally, innovation performance, entrepreneurial firms and younger firms distinguished the economic performance (sales growth) of not only more innovative firms from less innovative firms but importantly innovative firms from non-innovative firms.

What is significant is that many ‘more innovative’ SMEs have penetrated the international market and learnt more about international operations in terms of adhering to product delivery schedule, quality and packaging, among others. Thus innovation had induced internationalization of SMEs as well. Overall, our studies brought out the crucial role of technological innovation in building up the competitiveness of SMEs not just in the domestic market but more importantly with reference to the international market.

However it is important to emphasize here that such achievements are confined to a minority among the vast pool of SMEs even in auto components, machine tools and electronics industries of Bangalore in India. Bangalore occupies a unique position in India as it is known internationally as India's "high-tech city". Bangalore is considered one of the 46 "global hubs of technological innovation" (UNDP, 2001) and it is one of the globally known technology cities in the world (Rogers, et al, 2001). Even here not many of the "high innovation achievers" have gone for obtaining patents. The "patenting culture" is conspicuous by its absence among the SMEs of Bangalore. This could be attributed to the following factors:

1. A substantial proportion of SME innovations is incremental in nature, primarily carried out to satisfy their customer demand and they know pretty well that it is not worth patenting.
2. Even where innovations are radical, SME entrepreneurs do not know how to proceed to obtain patents.
3. Many innovative SMEs are not aware of the existence and services provided by Karnataka Council for Technology Up-gradation (KCTU), an exclusive state government agency to support SMEs for technology up-gradation and to provide assistance for obtaining patents, among others.
4. In some instances, SMEs have found it to be too expensive (in terms of money, time and efforts) to go for obtaining patents.
5. By and large, when SMEs carry out innovations, their primary objective is to thrive in the market in the short-run to medium-run, and hardly they think of their intellectual property being stolen by others. Many of them are satisfied when they get recognition (Certificates, Awards, etc.) from their large enterprise customers or SME Associations or sometimes from Banks.

### **3.-Technological Innovation Promotion among Indian SMEs: Policy Imperatives**

Considering the above findings, Indian Policy Makers have to face triple challenges with respect to SME innovation promotion:

1. How to inculcate and promote the culture of innovations among SMEs?
2. How to enhance the quality of SME innovations towards radical innovations?
3. How to encourage "patenting culture" among SMEs?

There is no easy solution to overcome these challenges. Concerted efforts have to be made by Policy Makers towards innovation promotion. We propose some policy recommendations to overcome the challenges.

First of all, it is important to recognize that the level of awareness among Indian SMEs regarding the crucial role of innovation in enhancing their firm level competitiveness is low. Therefore, there is an urgent need to spread the awareness through "innovate and succeed" campaign by narrating the achievements of SME innovators located in the respective regions. Regional SME innovators themselves can be involved in presentations. The network of Technology Resource Centres (TRCs) and District Industries Centers (both are national level SME promotion agency networks located across India) can take the lead in such campaigns, along with regional industry or SME associations. The need to protect the intellectual property gained in the process (in the form of obtaining patents) must be emphasized.

India has seen the growth of one of the largest networks of engineering institutions in the world in the recent decade. As of 2009/10, India had nearly 26,000 professional institutions including that of engineering education (Ministry of Finance, 2012). Special thrust should be laid on the promotion of innovative technology start-ups with the help of Venture Capital Funds (VCFs) and banks in and around technical institutions clustered cities and towns. This is important because innovation tends to develop in micro-climates with an

accumulation of talent, entrepreneurs, and knowledge. Like certain biological processes, this concentration favours a natural dynamism (The World Bank, 2010).

Small Industries Development Bank of India (SIDBI) and State Financial Corporations may engage in financing “innovative business plans” of SME owners/employees or employees of large firms to encourage emergence and faster growth of “entrepreneurial firms”. Entrepreneurship for many of the “entrepreneurial firms” has emerged from large firms (Bala Subrahmanya, et al, 2001).

Innovation performance of SMEs strongly depends on the synergies and external linkages in the local environment which offers insight into the decisive importance of interactions among firms, governments, and research institutes in the innovation process. A key factor for providing efficient support for SME innovations is that it is delivered in an integrated and coherent way with a maximum degree of flexibility. This requires organizations operating with sufficient autonomy and in a flexible manner for delivering support to innovators such as financial, technical, legal, etc. Innovation policy support is needed to offset the internal technical deficiencies of innovative SMEs by providing ‘accessible and productive innovation infrastructure’ for firms at different stages of their life-cycle.

It is imperative for policy makers to understand the specific needs of the local SMEs, with a focus on clusters. An all-round innovation support extended through R&D public service platform by Shanghai Municipality Science and Technology Commission in China stands out (The World Bank, 2010). This platform provides not only technical literature, management decision making support, entrepreneurial advice, equipment sharing, scientific figure sharing but also services of technology transfer, industry testing and professional technology to SMEs. Whether the network of India’s Technology Resource Centres can be revamped to provide multiple support services on the line of Shanghai Municipality S&T Commission is worth exploring.

The above proposed measures would largely enable the emergence of “innovation flourishing environment” for the benefit of SMEs in Indian economy. This has to be achieved as early as possible so that India can take advantage of its vast and growing SME sector not only for employment generation and export promotion but more importantly for giving a new direction to India’s future industrial development or even that of the global economy, through “radical innovations”.

#### **References:**

Bala Subrahmanya, M.H, M.Mathirajan, P.Balachandra and M.N.Srinivasan (2001): *Research Project on R&D in Small Scale Industries in Karnataka*, Report submitted to the Department of Science & Technology, Government of India, New Delhi.

Bala Subrahmanya, M H, M Mathirajan and K N Krishnaswamy (2008): *The Influence of Technological Innovations on the Growth of Manufacturing SMEs*, Report submitted to the Department of Science & Technology, Government of India, New Delhi.

Becheikh, N., R Landry and N Amara (2006): “Lessons from Innovation Empirical Studies in the Manufacturing Sector: A Systematic Review of the Literature from 1993-2003”, *Technovation*, Volume 26, Issue 5/6, pp 644-664.

Burrone, E and G S Jaiya (2005): *Intellectual Property (IP) Rights and Innovation in Small and Medium-Sized Enterprises*, World Intellectual Property Organization, Geneva.

Chaminade, C and J Van-Lauridsen (2006): “Innovation Policies for Asian SMEs: An Innovation System Perspective”, in Yeung, H W (Ed), *Handbook of Research on Asian Studies*, Edward Elger, London, pp 381-408.

Dobbs, M and R T Hamilton (2007): “Small business growth: recent evidence and new directions”, *International Journal of Entrepreneurial Behaviour & Research*, Volume 13, pp 296-322.

- Harrison, N J and T Watson (1998): “The Focus for Innovation in Small and Medium Service Enterprises, *Conference Proceedings of 27th Annual Meeting of the Western Decision Sciences Institute*, 7-11, Reno, NV.
- Hoffman, K, M Parejo, J Bessant and L Perren (1998): “Small Firms, R&D, Technology and Innovation in the UK: A Literature Review”, *Technovation*, Volume 18, No.1, pp 39-55.
- Longnecker, J G, C W Moore and J W Petty (2000): *Small Business Management: An Entrepreneurial Emphasis*, South-Western College Publication, KY.
- Ministry of Finance (2012): *Economic Survey 2011/12*, Department of Economic Affairs, Government of India, New Delhi.
- Ministry of MSMEs (2012): *Strategic Action Plan of Ministry of Micro, Small and Medium Enterprises*, Government of India, New Delhi.
- Mytelka, L (2000): “Local Systems of Innovation in a Globalized World Economy”, *Industry and Innovation*, Volume 7, No.1, June, pp 33-54.
- OECD (1997): *Oslo Manual*, Measurement of Scientific and Technological Activities: Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, Organization for Economic Cooperation and Development, Paris.
- Rogers, E M, S Takegami and J Yin (2001): “Lessons learned about Technology Transfer”, *Technovation*, Volume 21, pp 253-261.
- Solow, R M (1987): “Growth Theory and after”, Nobel Prize Lecture, December 8, [http://nobelprize.org/nobel\\_prizes/economics/laureates/1987/solow-lecture.html](http://nobelprize.org/nobel_prizes/economics/laureates/1987/solow-lecture.html).
- The World Bank (2010): *Innovation Policy: A Guide for Developing Countries*, Washington, DC.
- UNDP (2001): *Human Development Report 2001*, Oxford University Press, New York.