Enhancing technological innovation in small firms: Role of collaboration

D Singh[1], J S Khamba[2] and T Nanda[3]

[1]Assistant Professor, Department of Mechanical Engineering, Punjabi University, Patiala. Email: davinder5206@yahoo.co.in

[2]Professor and Head, Department of Mechanical Engineering, Punjabi University, Patiala. Email: jskhamba@gmail.com

[3]Assistant Professor, Department of Mechanical Engineering, Thapar University, Patiala.

Email: tarunnanda@thapar.edu

Abstract. Contribution of Micro-Small and Medium Enterprises (MSMEs) is highly remarkable in the overall industrial economy of the country. In recent years, the MSME sector has consistently registered higher growth rate compared to the overall industrial sector. With its agility and dynamism, the sector has shown admirable innovativeness and adaptability to survive the recent economic downturn and recession. However, MSMEs growth rate is still at low level. Therefore, it becomes essential for organizations to adopt new technologies or upgrade existing setup to meet continuously changing global market and fulfill customer needs. This paper explores the relationships between different collaboration networks and technological innovation of small firms through an extensive review of literature. The study finds that collaboration with larger enterprises, R&D institutions, universities and government agencies play a significant role in enhancing technological innovation in small firms.

Keywords: MSMEs, Technological Innovation, Collaboration, R&D.

1. Introduction

However, MSMEs contribution is phenomenal in the growth of Indian economy, simultaneously; they are facing intense pressure and constraints to sustain their competitiveness in globalized world. Some other issues such as recession, low demand, finance, heavy competition from MNCs etc. are becoming exposed problem to MSMEs in India [1]. Therefore, it becomes necessary for organization to adopt new technologies or upgrade existing setup to meet continuously changing global market and fulfills customer needs. The complexity of innovation processes led to a tremendous growth in the use of external networks by MSMEs [2].

Firms invest in the creation of knowledge not only for their own direct use, but also to more easily engage with others to create network ties. Indeed, collaborative ties between firms can lead to mutual or shared learning and the development of new or enhanced internal capabilities leading to technological growth, diversification and hence further innovative opportunities [3].


Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.
Published under licence by IOP Publishing Ltd

1.1 Basic Concept of Industrial Collaboration
Collaboration is working with each other to do a task [4]. It is a recursive process where two or more people or organizations work together to realize shared goals. This is more than the intersection of common goals seen in co-operative ventures, but a deep, collective, determination to reach an identical objective for example an endeavour that is creative in nature-by sharing knowledge, learning and building consensus [5]. In particular, teams that work collaboratively can obtain greater resources, recognition and reward when facing competition for finite resources [6].
In its traditional form, collaboration refers to the process in which geographically proximate producers, suppliers, buyers, and other actors develop and intensify cooperation with mutually beneficial effects.

However, in its most advanced form, according to a widely accepted definition proposed by [7], a cluster is a geographically proximate group of interconnected enterprises and associated institutions in a particular field, linked by commonality and complementarities. Under this definition, a cluster may include suppliers of inputs, or extend downstream to regular buyers or exporters. It also includes government institutions, business associations, providers of business services, and agencies that support clustered enterprises in such fields as product development, production process improvement technology, marketing information (for example, on new market and designs), vocational training, and so on.

2. Literature review
Innovation studies have underlined the crucial role played by the interaction of different organizations in fostering the innovation process [8]. Firm's innovation activity is enhanced and sometimes depends upon, collaboration with other organizations [9, 10] such as universities and research centers [11], suppliers and users and even competitors [12]. In order to carry out innovative activities, firms must accumulate and process internal and external knowledge, establishing learning processes based on different sources [13].

2.1. Technological Collaboration with Large Firms
Over the last few years, trade liberalization and globalization processes have increased customer expectations and competition between companies [14]. The development of new and improved products rather requires an active search-process involving several firms and institutions to tap new sources of knowledge and technology [15]. Exchange of information and resources with different partners are important factors in the innovation process. Inter-firm collaborations occur especially within technology-based industries. Inter-firm collaborations occur especially within technology-based industries. Arora and Gambardella [16] demonstrate the high importance of R&D collaborations for large US chemical and pharmaceutical companies in the biotechnology sector. Colombo [17] provides empirical evidence of complementary relationship between inter-firm cooperative arrangements and R&D intensity for a representative sample of international firms in the information technology industries.

2.2. Technological Collaboration with R&D Institutes
Forrest [18] has investigated the role of technology collaboration with R&D institutes in the German automobile industry. Formal R&D arrangements with universities are preferred because automobile suppliers can enhance their in house capacities and use their automobile-specific potentials more efficiently. In the specific case of technological collaboration, the alliances include collaborative R&D agreements, university and/or research institute agreements and technology licensing.

MSMEs, however, have alternatives to internal development that may enable them to bridge the resource gap that exists with large firms [19]. In this respect, the literature on innovation stresses the role of cooperative R&D in overcoming the lack of internal resources and in improving innovativeness and competitiveness [20].

2.3. Collaboration with Academic Institutions, Universities and Govt. Aided Institutes

Rogers [21] defended the strategic importance of the innovation process for the companies themselves. The relationship between the competitive capacity of companies and countries with the knowledge and its management have made the importance of structures like scientific and technological research through partnerships between universities or institutes and companies increasingly evident. These partnerships contribute to the development of science, its applications and the appropriation of innovations resulting thereof, and progress from the paradigm of industrial society to the society of knowledge can be seen as a crucial factor in the economic, social and cultural growth of nations and organizations [22].

According to Etzkowitz [23], the term "innovation has taken on a wider meaning. More than the development of new products in companies, it is also the creation of new arrangements between institutional spheres that provide the conditions necessary for innovation".

In this sense, collaboration between university, institution and company is also an important instrument in the generation of science and technology in a country. Since, by splitting costs and sharing risks between the two institutions, collaborative research allows for greater investment in the development of new technologies for products and processes that guarantee greater competitiveness to organizations and the broadening of the scientific knowledge of the nation.

3. Conclusion

In particular, MSMEs have to undergo some change when they compete with global companies and other large buyers, as they are dependent on supply contracts from the same. This puts considerable pressure on them to control both their costs and quality and meet the different legal requirements. This is a serious challenge for MSMEs, especially for those operating in developing countries. The need today is to enable MSMEs tide-over these problems and enhance their access to new technologies through the process of increased communication, cooperation and linkages, both within the enterprise as well as across enterprises and knowledge-producing organizations.

In this study, an attempt has been made to identify the factors affecting technological innovation of MSMEs. The present work presents four key issues under technological collaboration; which include *TC with larger enterprises, TC with R&D institutes, TC with academic institutions & universities, TC with government aided institutes* for the improvement in technological innovation of MSMEs.

4. References

[1] R. Jeswal, in: Role of SME in Indian Economy, National Conference on Emerging Challenges for Sustainable Business (2012).
[2] S.X. Zeng, X.M. Xie and C.M. Tam, in: Relationship between cooperation networks and innovation performance of SMEs, Technovation Vol. 30 (2010), p. 181–194.
[3] S. Brusoni, A. Prencipe and K. Pavitt, in: Knowledge specialization, organizational coupling and the boundaries of the firm: why do firms know more than they make?' Administrative Science Quarterly Vol. 46 (2001), p. 597–662.
[4] M. I. J. Moyano, in: Exploring the Dynamics of Collaboration in Inter organizational Settings, Creating a Culture of Collaboration, Jossey-Bass, Schuman (Editor) ISBN 0-7879-8116-8 (2006).
[5] Spence and U. Muneera, in: Graphic Design: Collaborative Processes-Understanding Self and Others (lecture) Art 325: Collaborative Processes. Fairbanks Hall, Oregon State University (2006).
[6] C. S. Wagner and L. Leydesdorff, in: The diffusion of international collaboration and the formation of a core group, Globalisation in the network of science (2005).
[7] M. E. Porter, in: Location, Competition and Economic Development: Local Clusters in a Global Economy, Economic Development Quarterly Vol.14 (2000), p. 7-20.
[8] M. Dodgson and R. Rothwell: The Handbook of Industrial Innovation, Cheltenham: Edward Elgar (1994).
[9] C. Freeman, in: Networks of Innovators: A Synthesis of Research Issues, Research Policy Vol. 20

(1991), p. 499–514.
[10] C. Freeman, in: The Economics of Technical Change, Cambridge Journal of Economics Vol. 18 (1994), p. 463–514.
[11] W. Cohen, R. R. Nelson and J. Walsh in: Links and Impacts: the Influence of Public Research on Industrial R&D, Management Science Vol. 48 (2002), p. 1–23.
[12] R. Coombs, A. Richards, P. P. Saviotti and V. Walsh, in: Technological Collaboration: The Dynamics of Cooperation in Industrial Innovation, Cheltenham: Edward Elgar (1996).
[13] S. Kline and N. Rosenberg: An Overview of Innovation. In: Landau, R. and Rosenberg, N. (eds.), The Positive Sum Strategy: Harnessing Technology for Economic Growth, Washington: National Academy Press (1986).
[14] J. R. Gradzol, C. J. Gradzol and S. T. Rippey, in: An emerging framework for global strategy, International Journal of Manufacturing Technology & Management Vol. 7 (2005), p. 11.
[15] B. Nooteboom, in: Innovation and inter-firm linkages: New implications for policy, Research Policy Vol. 28 (1999), p. 793-805.
[16] A. Arora and A. Gambardella, in: *Complementarity and external linkages: The strategies of the large firms in biotechnology,* Journal of Industrial Economics Vol. 38 (1990), p. 361-379.
[17] M. Colombo, in: Firm Size and Cooperation: The determinants of cooperative agreements in information technology industries, International Journal of the Economics of Business Vol. 2 (1995), p. 3-29.
[18] J. E. Forrest, in: *Strategic Alliances and the Small Technology-Based Firm,* Journal of Small Business Management Vol. 28 (1990), p. 37-45.
[19] G. Miles, S. B. Preece and M. C. Baetz, in: *Dangers of Dependence: The Impact of Strategic Alliance Use by Small Technology-Based Firms,* Journal of Small Business Management Vol. 37 (1999), p. 20-29.
[20] M. Rogers, in: *Networks, Firm Size and Innovation*, Small Business Economics Vol. 22 (2004), p. 141-153.
[21] E. Rogers, in: *Diffusion of innovations*, New York: Free Press (2003).
[22] H. Etzkowitz and L. Leydesdorff, in: *The dynamics of innovation: from national systems and 'mode 2' to a triple helix of university-industry-government relations,* Research Policy Vol. 29 (2000), p. 411-424.
[23] H. Etzkowitz, in: Research groups as 'quasi-firms': the invention of the entrepreneurial university, Research Policy Vol. 32 (2003), p. 109-121.