

Executive Summary

In the fast changing business environment and with fast paced technological development, R&D has emerged as crucial factor for the survival of business organizations. R&D has become a major decision area in the contemporary organizations. In the current competitive environment, R&D activities are considered as the source of competitive advantage to excel in the marketplace so as to ensure long run success. This research project is aimed at exploring the trends in R&D landscape in Indian Manufacturing Sector. An attempt has also been made to link R&D activities and output with firm performance. Results of the study are based on both secondary and primary data. For secondary data, 243 manufacturing companies, from CNX 500 of National Stock Exchange, across seven sectors were included in the study. These seven sectors were Automobile, Consumer Goods, Industrial Manufacturing, Metals, Pharmaceuticals, and Textile. Period of analysis, for secondary data, was ten years, i.e., from 2004-05 to 2013-14. For collection of primary data 51 manufacturing companies were included in the survey with representation from all the seven sectors. Using Content Analysis, trends related to Qualitative Intellectual Capital have been explored. R&D activities were measured on basis of R&D Expenditure and R&D Intensity. R&D Output has been measured on basis of Patent Applications, Patents Granted, Backward Citations and Forward Citations. Value relevance of different methods was measured by taking different kinds of returns and Tobin's q as the measure of firm performance.

Major findings and issues have been listed as follows:

- Positive trend coefficients were found across all the sectors for different types of intellectual capital disclosures with the exception of Pharmaceutical and Textile sectors.
- There was a significant difference across various sectors in terms of Relational Capital disclosures, Structural Capital disclosures, and Human Capital disclosures.
- For R&D expenditure, positive trend coefficients were observed for all the sectors. This phenomenon indicates that there has been an increase in spending on R&D activities by all

the sectors over the period of study. While for R&D intensity, positive trend coefficients were found in all the sectors with the exception of Energy, Metal and Textile sector.

- Significant positive growth trends has been witnessed for patent applications across various sectors with the exception of Consumer Goods, Metals and Pharmaceutical sectors.
- For grant of patents, significant positive growth trends can be seen for Automobile sector, Industrial Manufacturing, Metals and Pharmaceuticals sectors.
- Pharmaceutical sector was having highest R&D intensity across all the sectors over the period of study. This sector is also the leader in terms of Patent Applications and Patent Grant.
- Value relevance in context of firm performance was found for Intellectual Capital Based methodologies as well as Patent Applications. On the other hand, no value relevance was found for patents granted as well as citations. This indicates that currently Indian Manufacturing Sector is having 'Quantitative Orientation' towards R&D output rather than having 'Qualitative Orientation'.
- Major focus of R&D activities was found to be on product development and relatively less focus was observed for basic research and applied research. Lack of focus on basic research is quite evident from the results of the study.
- For technology acquisition, major focus of companies was to conduct In-house R&D followed by setting up Joint Ventures. Other sources such as contracting out, licensing in and cross licensing were considered less important.
- R&D outputs are exploited by Indian manufacturing companies largely by embedding the outputs in their own products and production processes . Activities such as licensing out and cross licensing were found to be negligible.
- Companies reported considerable research partnerships/associations with Universities and academic institutes both with in India and Abroad. More participation in International Research consortia was seen as compared to national research consortia.
- Sector specificity has been observed from the results of the study. Significant variations across the sectors have been observed for R&D activities, R&D output and linkage between

R&D activities and firm performance. Pharmaceutical sector stands apart from other sectors on the above-mentioned basis.

- Tendency on part of Indian manufacturing companies to go alone is quite evident from results. It has been seen that right from acquisition of technology to exploitation of technology Indian manufacturing companies tend to work in 'isolation'.
- For the majority of sectors, Licensing In and Cross Licensing options scored very low on importance scale both for technology acquisition and commercialization.
- Quality manpower availability and attrition of R&D manpower have emerged as the major hurdles in R&D landscape. There is a need for putting initiatives in place so that Indian manufacturing companies get quality manpower with basic skills related to the respective domains.
- Companies covered under the survey agreed that formal techniques to assess R&D returns were not used. Lack of formal techniques to assess R&D returns can lead to inefficient R&D investment with lower levels of productivity. This phenomenon can potentially undermine the investment in R&D initiatives.
- From the primary data based survey, it was revealed that one third of companies were not having any R&D policy in the organizations. R&D policy is considered vital for aligning R&D with the strategic goals of the organization and also provides a uniform directional framework for the organization as a whole.
- 'Technology Management' is a popular domain in the western countries. But this subject is sparingly taught in India either as part of engineering education or management education curriculum. Improved R&D management on account of better technology management skills can provide a boost to productivity of R&D and related investment in Indian scenario.