

# Technology Mapping Process to the Exploration of Collaborative Innovation Mechanisms in the Case of Carbon Nanotubes

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## Abstract

This paper presents an exploratory process to map out mechanisms of collaborative innovation. The framework is applied to the case of carbon nanotubes (CNTs). Specifically, the objectives of the paper are to analyse the nanotube innovation system in respect to the linkages of actors, the innovation system process, the type of networks or clusters and national technology capabilities. This study focuses on nanotube innovation system in regards to its network structure and collaboration mechanisms in different stages of its innovation process and illustrates the collaboration system with a case study. This study attempts to answer following research questions:

- How the leading actors are linked to each other and how effective is their network?
- What are the current network structures in terms of the linkages between and among organisations?
- What kind of collaboration mechanisms do exist at different stages of innovation process?

Collaboration is a course of action in which bodies share information, resources and responsibilities in the attainment of a common goal that is jointly planned, implemented, and evaluated by the participants. Networks function over linkages between individuals, organisations and shared interests. Sometimes networks can form formal or informal structures within or without a partnership setting. This research develops and demonstrates a collaboration framework. It would be expected that the highest level of collaboration occurs at the transformation stage. General linkages between academia and industry was presented by patent analysis and type of collaborations for nanotube technology for different stages was explained by interview analysis that were gathered from nanotech experts from this field. The research uses a large patent data set from Thomson Innovation Database which increases the accuracy of results. Our study uses the lexical method and patent codes to gather the required data. To analyse changes in the linkage structure, the paper uses VantagePoint software with the tech mining method. This paper contributes to the field by using the software in a different setting to how other users have used it to illustrate and expand the usage of this tool. Moreover, this paper justifies the significance of the simultaneous usage of the lexical method and patent codes in patent data analysis.

Both quantitative and qualitative methods are used to answer the above questions. Through the use of extensive patent analysis followed by expert interviews, the paper maps the collaborations in real time. The results indicate that Asian organisations are leading the nanotube field by leveraging small to Medium Enterprises (SME's) and the electronics industry. We found that Mono-linkage collaborations are an effective model which considers development progress of both parties. Furthermore firms in this sector seem to be at the initial stages of developing robust collaboration and innovation mechanisms, while they leverage new funding system to work together with others right from the start of the collaboration.