

ABSTRACT

Technology Business Incubators (TBIs) have become important institutional tools for promoting entrepreneurship, innovation, and economic development in developing economies such as India. Despite their fast growth, systematic empirical evidence on their effectiveness and the interplay of structural, institutional, and technological determinants is limited. The study adopts a multi-method approach combining econometric, structural, and decision-analytic methods. Using a longitudinal dataset of 300 incubators from across six regions of India between the years 2013 and 2023, the research uses factor analysis followed by advanced panel count models such as FENB and ZENB regression models to control for overdispersion and excess zeros in the outcomes of startup graduation. Complementing this, a multi-method approach including TISM, MICMAC analysis and AHP has been used to identify, structure and prioritize key incubation ecosystem determinants based on the inputs of 600 stakeholders including incubator managers, incubated startups, and non-incubated firms.

The findings show that scientific capability, mentorship systems and human capital intensity are the most important factors in incubator effectiveness and that access to funding and infrastructure play enabling roles. Structural modeling emphasizes mentorship as a key linkage variable that connects and strengthens other components of the ecosystem, whereas the econometric findings reinforce the role of knowledge-driven and institutional factors in improving startup graduation and innovation outcomes. Additionally, the study highlights the growing role of digital transformation, including AI, IoT, and data-driven decision systems, in enhancing incubation efficiency and strategic decision-making. The study further highlights the role of TBIs as critical components of entrepreneurial ecosystems that facilitate knowledge transfer, innovation diffusion, and startup capability development. By integrating institutional, technological, and ecosystem perspectives, the findings demonstrate how incubators contribute to regional innovation capacity and sustainable entrepreneurial growth. The insights generated are particularly relevant for emerging economies seeking to strengthen innovation-led development through evidence-based incubation policies and ecosystem-oriented support mechanisms.

The research makes a contribution to the entrepreneurial ecosystem literature by conceptualizing TBIs as knowledge-driven ecosystem orchestrators instead of simply infrastructure providers. It is an extension of the Technology-Organization-Environment (TOE) framework, incorporating structural interdependencies and multi-level ecosystem dynamics. From a policy perspective, the study offers actionable insights for the design of data-driven, technology-enabled and regionally adaptive incubation strategies for improving the success of startups and innovation performance in India.

Keywords: Technology Business Incubators (TBIs); Entrepreneurial Ecosystems; Startup Performance; Panel Count Regression; Innovation and Entrepreneurship; TISM; MICMAC; AHP; Artificial Intelligence (AI); Internet of Things (IoT)