

312 An agency approach to path creation by academics in technology research - lessons from semiconductor research in India.

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Research Domains

Academic practice, work, careers and cultures (AP)

Abstract

We examine the role of agency in how academics explore and create paths in emerging fields of technology research. Relying on structuration theory, we examine the mechanism and conditions that enable academics to explore new areas of research and develop those areas. Further, we analyze the effects of exploration and path creation on the productivity and identity of academics. Empirically, our study is situated in the context of semiconductor research carried out by academics in India. We employ a mixed methods approach that includes a bibliometric analysis of semiconductor research from 2007-2022 and semi-structured interviews with ten academics engaged in semiconductor research in various universities in India.

Full paper

This study investigates how academics in technology research explore new research areas and create new research paths. We investigate the following questions. First, how academics use their agency to explore new research areas and develop new research paths. Second is how universities' structure, resources, and policies influence actor-driven path creation. Third, what are the mechanisms and processes through which academics deploy their agency and their interactions with the (university) structure for path creation? Path-creation efforts can also shape academics' commitment to research, productivity, and professional trajectory. Therefore, we examine the effects of path creation on academic identity and the nature of the research being done.

Our focus on academics, rather than the university or the environment, is motivated by arguments that searching for new areas is inherently driven by the academic: universities themselves do not explore new research fields (Dahlander et al, 2016). Empirically, our study is situated in the context of semiconductor research done by academics in India.

By focusing on the agency of academics and their interactions with the structure, we enhance the perspective of organisations as the central actors to enable and anchor new fields of research. Further, by examining the effects of exploration on academic identity, we move forward the literature on path creation that has hitherto been limited to organisations and organisational capability and learning (March, 1991). Finally, through the bibliometric analysis, we provide empirical evidence on path creation in semiconductor research (Sengupta & Ray, 2017).

Research design, data collection and analysis

We employed a mixed method design, combining bibliometric analysis of academic research in the semiconductor domain and semi-structured interviews with academics. We used the VIDWAN Portal of the Government of India, an expert database of academics in India working in semiconductor research. A total of ten interviews have been conducted, with an approximate duration of 45-60 minutes. We analysed the data collected through interviews using qualitative data analysis methods, specifically employing thematic analysis.

We employed the bibliometric analysis method to examine path creation at the macro level. We used the widely recognized Web of Science (WOS) database for research done between 2007-22. To gather relevant research papers related to semiconductors, we conducted a keyword search using the term 'semiconductor.' We used open source software Visualization of Similarities (VOS) Viewer, R Studio for our analysis. This allowed us to examine the

patterns and trends within the retrieved literature, identify the prominent research areas, understand the semiconductor research landscape comprehensively, and uncover the structural aspect of path creation.

Preliminary findings

The evolution of new areas of semiconductor research

The bibliometric analysis showed not just new research areas emerging but also old areas seeing a gradual decline in the period 2007-2022. We hope to analyse the data further to examine correlations between the nature of universities that the academics were affiliated with and the emergence and growth of new areas. The bibliometric analysis also demonstrates the co-citation networks and the linkages between different institutions within India.

We intend to analyse collaboration patterns to explore if certain collaborations - across technological fields and universities - are more suited to the emergence of new research fields. Further, we plan to do a longitudinal analysis to examine if the growth of existing areas and the emergence of new research areas is correlated with any major policy interventions in higher education or, semi-conductor research.

The interaction between academics' agency and university structure

We now move on to analysing the semi-structured interviews to explore how the agency of the academics interacted with the structure for exploration and path creation.

Exposing academics beyond their disciplinary priorities: The participants described their exposure to new research areas by hiring new PhD students and teaching new courses. The participants described how the new PhD students brought in fresh disciplinary perspectives beyond their own. Participants in national-level institutes were de facto eligible for hiring PhD students, through the financial support of the institute, without having to generate their resources, making it easier for academics to recruit PhD students - early in their careers.

Strategic manipulation by actors: This was possible due to the dual nature of semi-conduction research involving theoretical and experimental research. The requirement of resources in theoretical research is less as compared to experimental research.

Collaboration: The collaborations were primarily through the researcher's interaction with different institutions through their research career. Academics also highlighted challenges with collaborations with industry due to the mismatch in the way academic research is conducted and the industry research is conducted.

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