

## COMPARATIVE ANALYSIS OF SOCIO-ECONOMIC IMPACT IN TWO PARTICLE ACCELERATOR CASE STUDIES

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There is a paucity of studies looking at the social impact of large research facilities like particle accelerators [1]. Extant research is often indirect, and diverse in its theoretical perspectives - for example, the sociology of knowledge creation in big-science contexts [2], using social constructivism theory to examine impacts of large-scale research facilities [3], and using grounded theory together with theoretical constructs from social network, social capital, and inter-organizational learning theories [4]. One overview of the social impacts of big science found that ‘the least understood, yet potentially the most significant aspect of accelerator facilities operates through their broader contributions to society and culture [5]. We are undertaking a comparative case study to better understand how the support offered through formal structured innovation programming has led to impacts such as strengthened innovation ecosystems, commercial applications of innovation, skills development, and broader social goods.

We use extensive interviews to create primary data identifying socio-economic outcomes. We are interested in positive and negative impacts, especially those with a long latency period - which are notoriously hard to quantify and are usually overlooked in the impact literature. In line with the work of M. Castells [6], in which value is created by transforming information into knowledge, we pay particular attention to knowledge spillovers as a socio-economic outcome. Our research identifies markers and criteria appropriate for particle accelerator-based outcomes; this will particularly include ‘softer’ socioeconomic impacts and the unspoken social impact mandates of accelerators borne of their public and educational nature.

Specifically, we test the applicability and transferability of innovation ecosystem model thinking to particle accelerators, their cultures and their supply chains and examine the extent to which design thinking can be applied to an open knowledge economy. Our study applies a novel spatio-temporal version of the Boisot social learning cycle [7] to innovation research to map the flux and codification of knowledge within the accelerator innovation ecosystem. This will identify the nodes in the system at which codified, abstract and diffuse knowledge is likely to germinate a new learning cycle: critical phases or ‘tipping points’ in the innovation ecosystem at which interventions are most likely to invoke radical innovation. Our findings are relevant for future innovation policy as well as for future strategic innovation programming at particle accelerators.

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