# Enculturing innovation : Indian engagements with nanotechnology

# Valorisation

**Relevance**

There are two broad relevances of the research results from this thesis; the first is related to the deficit, in the Indian context, of the social studies of science and technology while the second relates to ideas of innovation and the discourses that have become dominant in that context.

1) The social studies of S&T in India: In the Indian context, in particular, there is an obvious deficit in the ethnographic studies in the scientific laboratory and of social studies of the backstage of science and technology. The thesis makes an important contribution in filling that gap, and in doing so, illustrates the possibility, relevance and importance of doing such studies. There are some aspects of the thesis that have already generated much interest and discussion in India, both on account of the methodologies used and also some of the insights that the case studies and analysis have thrown up.

The thesis provides evidence of the larger relevance of the social studies of science and technology in the Indian context and could catalyse new engagements along these lines in India by having showed (how) it can be done and that it can also throw up interesting results. These results are not just of academic interest, but could provide answers to some of the key challenges faced in the country related to poverty, lack of access to basic facilities and the development and use of technologies that are relevant and appropriate. The thesis makes a step as much in bringing STS to India and it brings India to STS.

2) A discussion on innovation: The other point is related to 'innovation', the central theme of the thesis. Certain narratives of and on innovation have taken centre-stage in the discourses today and it is my contention that these represent only certain cultures and certain cultures of innovation. Innovation is happening in many different ways in different cultures and also within cultures depending on the available material, intellectual and contextual resources. There is a need to understand all of them- also because they could be contributing to and learning from each other.

The thesis provides evidence of this 'difference' in the cultures of innovation. I am confident that it will help start discussions and debates on the nature of innovation and also on the nature of the narratives around innovation. It will broaden our general understanding of what innovation is and how it is operationalized and will help acknowledge ways of knowing and doing that are otherwise considered marginal and non-important.

**Target groups for the thesis**

The thesis reaches out to a number of different groups. This includes, among others, the media, policy makers, researchers and activists in the non-governmental section and also academia, both in the social sciences and in the natural sciences.

The academic world, in particular, holds a special place in the hierarchy of society today and what this community has to say about science, technology and innovation tends to become the norm. It also, then, comes to be accepted as 'correct' and as received wisdom about the respective subjects, even though we know from experience on the ground that reality is much more complex and multi-dimensional, and needs engagements that are diverse and multi-faceted. It is, first and foremost, this academic community that I seek to influence through the results that have emerged from the research and my hope is that the debate will indeed be influenced. To the social sciences, STS offers pathways of studying S&T that have been barely explored in the Indian context; to the natural sciences the thesis offers a mirror – glimpses and insights of what happens back-stage in their own world, something they take so much for granted that it is often missed out completely.

The thesis is relevant for the other groups in different ways, but for reasons that are common – and that is the central role that S&T and innovation occupies in the discourses of nationalism and development today. The results of the thesis offer some important counter-points to the standard narratives of how science is done and technology is developed. They also challenge the received wisdom of what innovation is, what it should be and even who has the capacity to innovate. The results of the thesis, therefore, have the potential of challenging the policy maker who is engaging with science, technology and innovation at the same time as showing solidarity with the activists and communities on the margins who are either left out or neglected by the main discourses of innovation.

The media too will be offered new empirical material that is also coupled with a newer kind of analysis that the STS offers. There are new insights that the analysis offers and where implications go beyond the respective case studies. A good example of that would be the discussions around jugaad that are quite common in the Indian media. I am confident that the thesis, through the details of the case studies and through the creation of new conceptualisations like that of technological jugaad will force the media as well to look for jugaad in 'unexpected' spaces and bring in elements to the discussions that have been missing so far. This has, in fact, already begun to happen, some details of which have been outlined in the following sections.

**What next from here**

The main outputs going forward from here will be in the nature of multi-faceted engagements with different sections of society. This includes:

a) A larger academic monograph that will add to and expand the existing debates and discussions around innovation and science and technology
b) Non-academic, long-form narrative non-fiction accounts of life and work within respective laboratories that make up the empirical chapters of the thesis with a potential theme being 'The biography of a laboratory'
c) Academic papers based on the key themes that emerge from the thesis
d) Shorter articles in newspapers that will explore the empirics of the respective laboratories and/or the key thematic areas that the thesis deals with
e) A series of lectures on STS in India with the focus being on the specific laboratories
f) Photographic exhibition/s based on the pictures taken during the course of the research work.

Some of this has already begun to happen:

a) An article on the making of indigenous STMs in India that is based on one of the case studies was published a couple of years ago in *Current Science*, India's leading science journal. It evoked very positive reactions from scientists and from social scientists. It generated interest in the media as well with one prominent national newspaper, *The Telegraph*, using that article as the basis for a feature on jugaad and on instrument making in Indian laboratories
b) I've begun presenting the specific case studies and the larger conclusions from the research in lectures depending on the opportunities available. Most recently I spoke on 'technological jugaad' and instrument making in the Indian laboratory at the Indian Institute of Technology in Mumbai which generated much interest in the students and faculty. A couple of students have been in touch and are interested in working further on similar lines
c) I helped organize and co-ordinate a workshop in September 2015 at the Students Conference on Conservation Science (SCCS) in Bengaluru in September 2015 on a theme that was influenced by my learnings from and experience of doing the PhD. Titled 'What is behind a scientific article – what can sociological and anthropological investigations tell us about writing a scientific paper and doing science?' it brought together a panel of ecologists, social scientists and a historian to present their experiences and perceptions on the subject. This was a very well received and a

'surprising' workshop for most of the students and faculty who attended.

The key element in the thesis and its methodology is its novelty, particularly in an Indian context. It comes as a surprise to many inside and outside the world of science that something called the sociology of science or STS even exists, that sociologists can study science and scientists just like they study other aspects of the society in which scientists live and work.

It is in this context that the work of the thesis can be considered innovative –

a) in the investigative and research methodologies the thesis is based on,
b) in the nature of the engagement with laboratories in India and
c) in the insights that are offered on the process of innovation within contemporary science and technology in India

The primary value of the thesis revolves around the possibilities it has created in participating in and influencing the discussions and discourse around S&T and innovation.

I am hopeful that some of the activities and ideas outlined above will come to fruition in due course of time. A lot would depend, of course, on human and financial resources that I am able to mobilise and the opportunities I am able to access and exploit both inside and outside the academy.