

India's Technological History through the Looking Glass



Midnight's Machines: Political History of Technology in India; By Arun Mohan Sukumar; Penguin Random House India, Gurgaon, India, 2019, ISBN: 9780670091096.

Introduction to the Book

The book “Midnight's Machines: Political History of Technology in India” takes up the subject of industrial policies and reviews India's technological development since independence. The author has focused on the ‘Make in India’ program of the government of India and evaluated the potential development of the country. This is done through drawing parallels between the visions of national leaders (prominently Madan Mohan Malviya, Jawaharlal Nehru, Rajiv Gandhi, Principal Scientific advisors to the Prime minister in the past and Narendra Modi) with technological development in their contemporary international policies and viewpoints. This is done in compelling storytelling through four chapters

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of the book. The book is a good source of information about many inside stories behind familiar developments in history. Its intended audience is vast and its standard is reflected from the widespread praise it has received in the short period since release.

Understanding the analytical framework of the Book

It views Indian technology policies and explores mainly based on the controversies about technology development since independence. There is predominantly an inclination towards technology-led growth based perspective in evaluating the technology policies of the past. Interestingly, the book has not examined any of India's science and technology policy documents.^[1] Instead, the narrative presented is mostly informed by news articles, speeches, opinion pieces, government reports, articles in journals and magazines, etc.

1. Since independence four policy documents have been released namely, Scientific Policy Resolution 1958, Technology Policy Statement 1983, Science and Technology Policy 2003 and Science Technology Innovation Policy 2013.

This book takes a stance more aligned to looking at the process of technology development that supports technology import over the capacity building. Since the book covers such a vast expanse of time and refers to so many ideas and events, it is more like a storybook with exciting insights. This makes it easier to read and understand rather than a book in the technology policy of India.

Need for focus on sustainable policies

The book puts the history of technological development in India from the perspective of the fourth industrial revolution. It provides an incremental four-stage chronology of technology development in its four chapters covering the period between 1947 and 2019. In the preface, the author lays down the analytical framework and background for the book. This section highlights the view of technology as a driver of economic, social and cultural change in a country. The author has looked at the technology adoption and import as an essential precondition to capacity building. This viewpoint of technology-led growth calls for technological advances as one of the three indicators of economic growth. Capital accumulation and an increase in population and workforce are the other two indicators under this point of view.^[1]

The readers of this book would have benefitted if this section had weighed the alternative views on development, considering the limitations that are intrinsic to an approach of rapid and focused technological change. The author acknowledges the role institutions play in the building of economies; however, this aspect could have been much more prominent to make a case for sustainable technology policies in the future. Considering the global development scenario and requirements in the emergent changes from the threat of COVID-19, the importance of a comprehensive technology and development policy is more than ever. The preface would also have benefitted from reflecting upon the performance of Make in India in the five years of its implementation.

Focus on technology development versus capacity building and technology transfer

The first chapter of the book entitled, "Age of innocence," traces the initial development in India's technological landscape under the leadership of Nehru and Indira Gandhi. It encompasses the interventions in the industrialisation, scientific research, indigenous technology development and the politics behind technological developments. The author narrates the development in the national scientific outlook and planning through events such as the community development program, development of 'solar energy group' in the follow up to the idea for using solar energy (i.e., solar cooker developed in NPL) and provides a critique to the failure of CSIR to scale up the technology for use. In the later section, the author talks

about the fallout from the failure of CSIR and compares it to the Indian Space and Nuclear Programmes.

The second section of this chapter is about the impact of World War II on global economies, national priorities (financial, technological, social) and international trade and technology transfer in the years that followed the war. The rise of the United States as a global manufacturing hub, the subsequent Marshall plan to cement its authority and the inability of other countries to challenge its hegemony because of waned influence on global and their national economies. This section underlines the technological development in India and the role of Colombo Plan in enabling the technical projects for capacity building in cities like Bombay (Mumbai), the rise of AMUL, acquiring experts to train Indian engineers, building manufacturing plants, dams, nuclear reactors and institutions like AIIMS and the IITs.

A shift in demand and national priorities

The second chapter, entitled "Age of doubt", continues the story of Indian development. It changes the focus from technology to human resources. It narrates the state of affairs in the leading institutions like the IITs, IIMs, IISc, TIFR and the major scientific laboratories. The chapter places its narrative in the backdrop of the China-India war of 1962 and its impact on the science and technology policy of the Indian government. India's loss in this led to the 'age of doubt' where scientists and experts realised the need to invest in the development of technologies and products that could contribute to India's security readiness. The national landscape of technology, which was dominated by manufacturing heavy machinery, was about to shift towards the small consumer goods and military equipment, specifically in the electronics sector. This transition was mired with controversies and resistance from the government leading to the constitution of committees (Union Cabinet's working group of 1962 to discuss applications of technology after the war, Bhabha Committee of 1963 to access the total electronics requirements of the country). The author has drawn interesting and useful comparisons of these developments with contemporary academics like Crozier and J.D. Bernal. This era was punctuated by the demise of Nehru and Homi Bhabha, leaving a vacuum in the technological leadership of the country. The subsequent years saw experiments by the Indian government in the import of technologies through international firms and the establishment of the state as the regulator, producer, as well as the biggest consumer of technology in the country. The author argues that this led to the development of a system that alienated common men from technology and made the black box of technology into a virtually inaccessible to the society at large.

The vacuum in science and technology policy would later be filled by individuals like P.N. Haksar, B.D. Nag Chaudhari, K.C. Pant and Satish Dhawan. These individuals led crucial institutions and led to major breakthroughs in the field of industrialisation, missile and nuclear programmes, atomic space and electronics programmes respectively. Their efforts paved the way for the independence of organisations such as ISRO, DRDO and DST, to name a few.

Efforts at indigenous technology development

In the third chapter, titled “Age of Struggle”, the author traces the developments in the Indian technology landscape under the Rajiv Gandhi government. The focus of this chapter is on the integration of technologies in the national setup through various interventions by the national government. It argues that the exclusion of common men from technology led to a state of mistrust towards foreign technology and opposition to collaborations for technology transfer. Here the country programmes, such as the Indo-US Vaccine Action Programme, Human Genome Project, Computerised Rural Information System Programme (CRISP), NICNET, the establishment of VSNL are explored and their impact on the India's information technology (IT) sector is evaluated. The chapter draws from the failure of VSNL's gateway internet service, NICNAT and the attempt at establishing a semiconductor manufacturing hub in Mohali. It highlights that these initiatives though intended well, could not succeed due to factors such as the influence of the personal and political agenda of the administration and bureaucracy. On the other hand, ISRO, an organisation which had greater autonomy and a close correlation to DRDO's Integrate Guided Missile Development programme (IGMDP) had greater success at developing Satellite launch vehicle (SLV-3).

Towards Make in India

The fourth and the final chapter of the book, entitled “Age of Rediscovery”, draws from the evaluation of Indian technology development during the 70 years and traces a trajectory for the impact of Make in India programme on the technology future of the nation in the future. Beginning at the benefit to Indian IT industry from the Y2K problem of 1999, migration of leading IT professionals to the USA and barriers to the development of competitive computer technology in India this chapter presents a narrative of challenges faced and the outcomes of state policy in the development and use of technology in the country. In its final part, the chapter draws on to the implications of these developments for the recent technological developments such as the Aadhaar. The vision of Narendra Modi and his government is presented in contrast and concert with the impact of policies, successes and failures of his predecessors.

Analysing the conceptual framework of evaluation used in the book

The book provides a detailed account of the ‘political history of technology in India’ and along the way also provides insights that predominantly drawn from the neoclassical theory of growth. According to this theory, as a result of technological transformation in a region, country the per capita income increase and through increased investment in the economy, national productivity increases over time. This relationship between technological change and economic growth, first observed by Schumpeter, has motivated countries to invest in the development of new technologies. The story of technology in India presented in this book demonstrates the evolutionary development process or creative destruction where technology sectors with weak impact (namely, solar mission and heavy industries) were replaced with new technologies such as military, space, nuclear and IT sectors.

The book explores the impact of political, social and strategic developments (both on the international and national levels) on the technology landscape of India. Schumacher argued that technology transfer from developed to developing countries could have unintended effects on the various factors of development. Technology transfer from developed countries can create inefficient production and imbalance in the distribution of revenues. This is perhaps what was observed in the case of India during the period covered in the second and third chapters of the book. Even after the realisation that the national priorities are in other sectors, due to the huge investments, a technology lock-in effect and a lack of technical capacity for new technologies prevented the government from shifting the focus to new sectors of technology development.^[2] So, it is imperative that future technology policy carefully chooses the technologies that are imported and adopted in the country.

As a matter of fact, negative consequences of technological transformation and industrialization – for example, rapid consumption of natural resources, pollution of the natural environment and disruption of the ecological balances – are much restricting the chances and sources for future generations. Rapid consumption of the resources poses a threat to significant hostilities and conflicts among the nations in the future. One school of thought believes that under-developed or developing countries must attempt to build their scientific and technical capabilities to create their own technologies according to their countries' social and economic conditions. In line with this aim, these countries must adopt an effective scientific and technological policy. They must make social, economic and cultural independence and self-sufficiency their priority under that policy.^[3]

It is generally accepted that technological transformation is one of the most basic determinants for a rapid increase in the production volume and income and is a must for achieving international competitive power. In its book named “Competitive Superiority of the Nations,” M. Porter addressed “competitive capacity” from the aspect of “enhancing life standard/wealth of society”. He defined it as the ability to increase productivity. In that regard, Porter points out to the fact that competition race is made totally among innovative firms and gaining the ability to create technological novelties in these firms results in both an increase in the productivity and also guarantees competitive advantages in the international markets.^[4]

Stewart^[5] argued that the factors affecting technology leave their mark to the country in which the technology is developed, what of the countries where this technology is imported and adopted? This book presents the dynamics between technology and the different factors affecting its development and adoption.

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