

The Long Revolution – The Birth and Growth of India's IT Industry. Dinesh C. Sharma. Harper Collins Publishers India Ltd, Plot No. 11, DLF Industrial Estate-II, Faridabad 121 003. 2009. XXI + 488 pp. Price: Rs 595.

This is an unusual book in more ways than one. Right from its title it talks of the 'long' revolution, unlike many accounts both from India and abroad, which project Indian IT to have started with Y2K! It is written by a person with a background in journalism, and yet the book is well researched, has copious references, includes a comprehensive index and provides due acknowledgements to the hundreds of organizations and individuals. Though a long book, it is immensely readable. There are nuggets (like DoE putting conditions to Fairchild Semiconductors) that are not widely known to the younger generation; these add special value to the book. All in all, a timely book that is a 'must read' for all IT professionals in India who are keen on 'tracing the roots' and anyone wanting to understand the true nature of an undoubtedly important revolution that is taking place in India over the past five decades (more visible in the past 10+ years).

The ten chapters are not necessarily in chronological order, though the first four chapters can be equated with the fifties, sixties, seventies and eighties.

'India's first computers' (chapter 1) and 'In the state's shadow' (chapter 2) talk of the not widely known attempts to build a full-scale computer in India, and, the early successes (though not a commercial success due to sub-critical funding). The book also brings out vividly the

wide range of scientific applications by two well-known establishments, namely Indian Statistical Institute (ISI) and Tata Institute of Fundamental Research (TIFR), and the establishment of Electronics Corporation of India (ECIL) and Department of Electronics (DoE).

While 'A young PM, computer boys and proto liberalization' (chapter 4) talks of early success including that of C-DOT and NIC as well as liberalization, 'The rise, fall and rise of IBM' (chapter 3) talks of the interesting early days with IBM dominating the scene and the 'IBM go back' incident attributed to trade union leader turned minister George Fernandes.

The remaining six chapters trace the revolution over the decades, once again justifying the title ('long revolution'). The book takes a balanced view emphasizing software, hardware, design and services (both software services and other services that include Business Process Outsourcing (BPO), Knowledge Process Outsourcing (KPO) and engineering services).

On the hardware side, (i) chapter 9 on 'Wafers chips and Indian design skills' brings out the serious attempts in the semiconductor space, with a first generation 'fab' at Bharat Electronics and a relatively cutting-edge 'fab' in the form of the Semiconductor Complex at Chandigarh. The design success with Electronic Design Companies (EDA) like Cadence is well documented. The current proliferation of many design companies (Tejas Networks and Saskaen, for example) would not have been possible without such early development.

(ii) Many younger readers will be amused to know that Robert Noyce, the then President of Fairchild Semiconductors (who later co-founded Intel) visited India and met with government officials who wanted the equity to be capped at 50%, royalty fixed at 4% and most ridiculously, production capped at 0.6 million devices (instead of 10 million devices proposed by Fairchild)! They went to Hong Kong, set up a 50 million device facility and as they say the 'rest is history'.

(iii) 'Discovering a new continent' (chapter 6) documents the story of Indian companies, notably in the private sector, taking to manufacturing computers and peripherals in a big way (the private sector was allowed entry into this segment only in 70s); the story of pioneering

companies like DCM Data Products, HCL, Wipro and PSI is narrated with riveting details.

On the software and services side, (i) 'Big boys, garage startups and software codes' (chapter 7) and 'Transition to software' (chapter 8) bring out the major success story of the Indian IT industry, namely software services. The TCS story is traced back to Lalit Kanodia writing a report to the Tatas to set up a computer centre; the story of Infosys is traced back to the team headed by N. R. Narayana Murthy working in Patni Computer Systems. The 'global delivery model', the arrival of the Internet that 'levelled the field' and the supporting role played by governments through Software Technology Parks of India (STPI), tax concession, conducive policies and environment (IT Policy, IT Ministry) are all well documented. Due credit has been given to many Indian IT companies, including Softek, Mastek, IIS Infotech, Four Soft as well as MNC companies in India, including Digital Equipment Corporation (DEC), HP and IBM.

(ii) 'Turning geography into history' (chapter 10) once again brings out in a balanced manner the story of services (financial, back-office, engineering and R&D), including the early attempts (once again doing justice to the title of the book).

Recognizing the central role played by the educational institutions in India in the story of Indian IT industry 'Building human capital' (chapter 5) talks of the Master of Computer Applications (MCA) programme conceived by V. Rajaraman (IIT Kanpur) and the vision of the Indian Institutes of Information Technology (IIITs) originally conceived by N. Seshagiri. Interestingly, the book emphasizes the fact that the starting of CSIR and the planning of the Indian Institutes of Technology (on the lines of MIT) were planned even in pre-independence days – Sir Dalal (circa 1944) and Sarkar Committee (circa 1946).

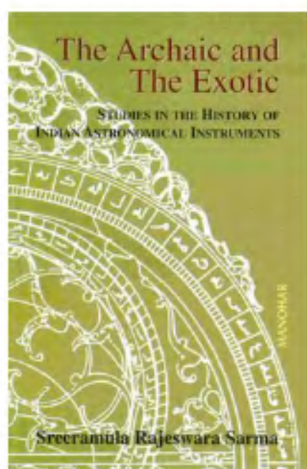
This is a welcome attempt to document the evolving story of Indian IT industry. While it has done its job admirably well, it could not do justice to all its facets, notably the recent success in the Net companies (Rediff and Emerge, for example), e-enabling of every service (e-banking, e-ticketing, e-books, e-learning) more specifically e-governance, and unusual companies (Redbus and MingleBox, for example); may be the

author can write one more book after a couple of years.

Once again, for anyone seriously interested in understanding the story of Indian IT, this book is a 'must read'.

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The Archaic and The Exotic: Studies in the History of Indian Astronomical Instruments. Sreeramula Rajeswara Sarma. Manohar Publications and Distributors, 4753/23 Ansari Road, Daryaganj, New Delhi 110 002. 2008. 319 pp. Price: Rs 795.

We hear a lot about the astronomical observatories of Sawai Jai Singh, about the beginnings of modern astronomy in India, and about the theoretical contributions by Indian astronomers – from Aryabhata to Bhaskara to Kamalkara. There is less available material about astronomical instruments and their usage from early times, to the beginnings of modern astronomy in India.

Some information about early astronomical instruments is compiled by Subbarayappa and Sarma¹, a chapter of which gives extracts from the works of Indian astronomers related to instruments and their usage. There is some information with details of a few individual instruments in the works of Ansari and Khan Ghori², Sarma *et al.*³.

The work of Sreeramula Sarma, filling this gap, is also of interest due to the fact that there is a general view that historically, Indian astronomical endeavours have always been more on the theoretical side, while actual instrumentation and observations had taken more of a back-seat, until the (poignantly anachronistic) efforts of Sawai Jai Singh.

However, intricate astronomical instrumentation (some utilitarian and some valued more for their exquisite craftsmanship or innovations in construction) seems to have existed in the last millennium in various corners of the country, whose evidence has been lying forgotten in dusty museums.

Through painstaking work, Sarma has put together a comprehensive view of astronomical instruments used in India before the time of Sawai Jai Singh. It makes for an exhilarating reading – getting to know a wealth of information about the archaic as well as the exotic astronomical instruments made and used in India from the times of Brahmagupta, in Feroz Shah Tughlaq's times, instruments in Mughal miniatures, exquisite astrolabes and celestial globes!

One aspect that would have added a quantitative element of interest to the description of the instruments mentioned in all the chapters of the book, is the actual accuracy in measurements by the extant specimens of instruments. Such a quantitative look is rather difficult, perhaps, in the Indian context, where observational results have not been recorded for the most part. The accuracies in the depictions of the stars in the extant astrolabes, or accuracies with any of the extant measuring instruments if touched upon, would have added an additional, but necessary element of interest.

The division of the book into the four segments – (1) The context (2) Water clock (3) The astrolabe and (4) The celestial globe, from the various research articles by the author, seems a useful roadmap. The first paper in this series gives a listing of sources and extant instruments, digging out many obscure references and describing instruments from worldwide museums. There are questions that one wishes were addressed, even if not answered.

How much of actual usage did these instruments see? What were the accuracies of these instruments? What was being done by the observers to correct accumulated errors in water clocks and

the differences from seasonal hours? What was the status of knowledge about the equation of time at the time of usage of these instruments? These questions do not find any place in the book, perhaps also because it is precisely these questions that are so difficult to ask, let alone answer, when it comes to Indian records of early observations and instruments.

Detailed descriptions on the manufacture of astrolabes and celestial globes as a part of the author's catalogue in preparation, is a useful guide to follow up in detail, to see whether any of these instruments were used with some seriousness for observing and their resulting accuracies.

From the workmanship point of view, there are interesting discussions about the instruments. For instance, the universal astrolabe manufacture and the unusual celestial globe manufactured for Aurangzeb, which when lit from inside, would show a glowing celestial sphere through the drilled holes for the star positions (the first planetarium in India).

The chapter on the astronomical instruments in the *Brahmasphutasiddhanta* discusses nine instruments mentioned in the 'Yantradyaya' chapter by Brahmagupta. It however, does not mention the Armillary Sphere that seems to have been discussed by Brahmagupta in the *Goladhaya* of the *Brahmasphutasiddhanta*, a teaching instrument more complex than the simple measuring instruments discussed in the *Yantradyaya*. However, the conclusion drawn, that the measuring instruments were confined to the rather simple versions, while flights of fancy in discussions of possible automated time-measuring instruments as well as perpetual motion machines in the *Brahmasphutasiddhanta* as well as other Siddhantic works, might well have to be accepted. This actually seems to indicate that the measuring instruments mentioned – the Dhanus, Turyagola, Cakra, Yasti, Sanku, Ghatika, Kapala, Kartari, and Pitha – were actually built and used for observations by the authors who wrote about them, a point perhaps at variance with the conclusion drawn from this chapter in the book.

One interesting chapter in the book deals with the astronomical instruments in Mughal miniatures. The Mughal miniatures, which depict either a ring dial or a chuda yantra, water clock, or a sandclock, are all described in detail and the near absence of astrolabes in Mughal