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ScienceDirect
Technological Forecasting & Social Change 74 (2007) 1519–1538
Technological Forecasting and Social Change

Assessment of China's and India's science and technology literature — introduction, background, and approach

Ronald N. Kostoff [a,*], Sujit Bhattacharya [b], Michael Pecht [c]

[a] *Office of Naval Research, 875 N. Randolph St., Arlington, VA 22217, USA*
[b] *National Institute of Science, Technology and Development Studies (NISTADS), Pusa Gate, K.S.Krishnan Marg, New Delhi-110012, India*
[c] *Center for Advanced Life Cycle Engineering (CALCE), University of Maryland, College Park, MD 20742, USA*

Received 9 February 2007; accepted 16 February 2007

Abstract

Science and technology (S&T) allows (1) automation to replace human labor, (2) enhanced human labor capabilities, (3) quicker and cheaper production of goods, and (4) more complex products and processes. In order to maintain competitive advantages, it is critical for any country to understand what other countries are producing in S&T, and what intrinsic S&T capabilities are being developed.

India and China are the two most populous countries in the world. These two dynamic economies are advancing rapidly in S&T, and it is prudent to assess the quantity and quality of their research output as well as to examine trends in their S&T capabilities.

This paper, the first of four in a Special Section on China's and India's S&T, introduces the remaining three papers. Specifically, this paper describes the motivation for the studies, the background for understanding national S&T assessments, an overview of text mining, a brief picture of the Indian and Chinese S&T establishments, and a summary of the analytical techniques used in the assessments.
Published by Elsevier Inc.

Keywords: China; India; Science and technology; Research evaluation; Research assessment; Technology assessment; Text mining; Bibliometrics; Computational linguistics; Document clustering; Factor analysis; Correlation mapping; Core competency

* Corresponding author. Tel.: +1 703 696 4198; fax: +1 703 696 8744.
E-mail address: kostofr@onr.navy.mil (R.N. Kostoff).

0040-1625/$ - see front matter. Published by Elsevier Inc.
doi:10.1016/j.techfore.2007.02.004

1. Introduction

The present Special Section examines the S&T literature of India and China, the two most populous countries in the world. Both these countries are among the fastest growing economies of the world. Their growth has been attributed to the liberalization of their economies: China in late 1980s and India in the early 1990s, helping these countries to integrate with the world market. This transition has affected these two countries in many ways, such as the changes in composition of their economies from primarily agrarian towards technology governed activities. China has emerged as a leading center for manufacturing industry, whereas India is emerging as a hub for providing services (primarily software development) for the global economy. Both have low cost advantages and large highly-trained manpower pools that add to their competitive strengths. They are striving to assert their presence in the world-market as technologically sophisticated countries [1]. Additionally, India is expanding its capabilities in the manufacturing sector, and China is expanding in the service sector market. Both these countries are demonstrating technological capabilities that have been the forte of technologically developed economies. Thus, India–China studies evoke special interest. The present Special Section undertakes a detailed assessment of the S&T capabilities of these two countries based on research output in journals. The quantity and quality of their research output as well as trends in their S&T capabilities are examined in this context.

Table 1 provides some idea of the intrinsic resources of these emerging economies, using the USA for comparison.

The above table provides some interesting insights into these two countries. China's GDP is more than double that of India, and about 70% that of the USA. India's population is substantially younger than that of China, and China's population in turn is younger than that of the USA. At the same time, India's birth rate is almost double that of China or the USA.

One important indicator is the investment in R&D as percentage of GDP. Until 1998, India's R&D intensity was higher then that of China, in the range of 0.6 to 0.8%. However, China has now reached 1.4% level whereas India is still below the 1% level. Another important indicator is Foreign Direct Investment (FDI) in R&D. Both countries are emerging as favorable locations of foreign R&D centers. A United Nations Conference on Trade and Development (UNCTAD) survey [2] during 2004–2005 of the world's largest R&D spenders shows the growing importance of these two countries as R&D locations. About 35% of the major Transnational Corporations (TNCs) already have R&D centers in China, whereas about 25% have centers in India. Moreover, China is the destination mentioned by the largest number of respondents for future R&D expansion followed by the United States. Third place in the global destination choice of

Table 1
Comparison of India–China–USA resources

India–China–USA resource comparison (2006)			
Resource	India	China	USA
Land mass (M SQ KM)	3.29	9.6	9.63
Population (B)	1.1	1.31	.298
Med age (years)	24.9	32.7	36.5
Birth rate/1000	22	13.3	14.1
GDP (T): (purchasing power parity)	3.61	8.86	12.36
GDP (T): (official exchange rate)	0.72	2.23	12.49