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Chinese science and technology — Structure and infrastructure

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Abstract

This paper identifies and analyzes the science and technology core competencies of China, based on a sampling of approximately half of the total Chinese publication output in the Science Citation Index/ Social Science Citation Index (SCI/SSCI) [SCI. Certain data included herein are derived from the Science Citation Index/Social Science Citation Index prepared by the Thomson Scientific[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright Thomson Scientific[®] 2006. All rights reserved. [1]] for 2005. Aggregate China publication and citation bibliometrics were obtained and a hierarchical research taxonomy, based on document clustering, was generated. Additionally, bibliometrics and thematic trends were tracked over the past two decades.

The key findings were that China's output of research articles has significantly expanded in the last decade. In terms of sheer numbers of research articles, especially in cutting-edge technologies, such as nanotechnology and energetic materials, it is among the leaders. Compared to the USA, the bulk of China's articles focus on the physical and engineering sciences, while the USA articles (compared to China) focus on medical, social, and psychological sciences.

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1. Background

There are many reasons to understand the state and trends in a country's science and technology (S&T). For example, Kostoff et al. [2] conducted a text mining assessment of the global nanotechnology literature including that of the USA, India and China. Pecht [3] noted that China has made significant achievements in hi-tech areas that are keys to economic development and has begun to gain ground in the world's S&T community.

This paper presents the text mining of a sub-set of China's national research core competencies in terms of the identification of China's main research thrusts, volume of research output in main research thrusts, and bibliometric and thematic temporal trends.

2. Approach and results

In this paper, two types of results are presented, bibliometrics and taxonomies. Bibliometrics provide an indication of the technical infrastructure (prolific authors, journals, institutions, citations), while taxonomies provide an indication of major technology thrusts and their relationships.

Fig. 1 shows the number of SCI and Engineering Compendex (EC) [4] research articles per year as a function of time. The SCI data is denoted by diamonds, while the EC data is denoted by squares. A best fit curve to the SCI data (see Fig. 1) shows an exponential annual growth rate of approximately 20% over the 25 year time period.

The SCI output contains a field called Subject Category. It is essentially a classification by technical thrust of each article. Table 1 lists the top ten Subject Categories for all of the Chinese research articles since 1980. There has been a gradual shift of emphasis from multidisciplinary science, medicine, and life science in 1980 to that of materials, chemistry, and physics respectively in 2005. This correlates with China's emphases on the physical and engineering sciences relative to the USA's emphases on medical, sociological, and psychological sciences, a point that will be discussed in the last section of this paper.

The EC contains fields called Classification Code and Controlled Vocabulary, both of which are similar to the SCI Subject Category field. Table 2 lists the top ten classification codes for all of the Chinese

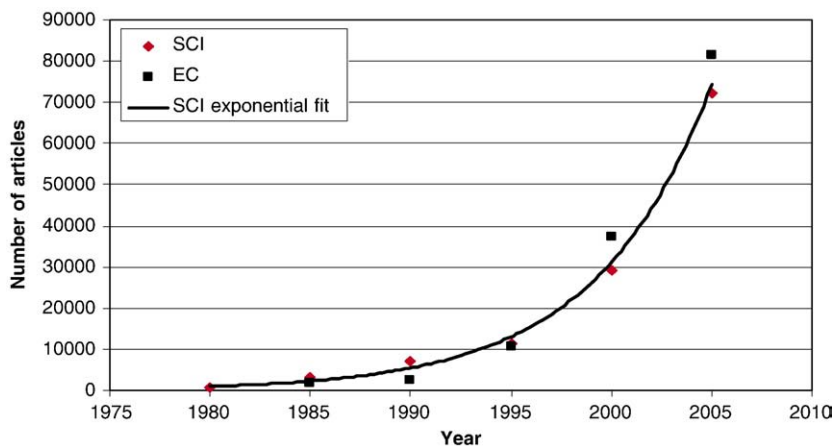


Fig. 1. Number of SCI and EC research articles annually with at least one Chinese author.

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