1.1 Introduction

Science and Technology play an important role in transforming India into a modern, industrialized society. Science, technology, and innovation are even more relevant today. Scientific knowledge and expertise, innovation and skilled workforce are the assets of this era. Science and Technology are important drivers of economic growth and development in the contemporary world. This area will help the country to achieve sustained and rapid growth in the future (Planning Commission Government of India, 2012).

India is one of the top-ranking countries in the field of basic research. Indian Science has come to be regarded as one of the most powerful instruments of growth and development, especially in the emerging scenario and competitive economy. In the wake of the recent developments and the new demands that are being placed on the Science & Technology system, it is necessary for us to embark on some major science projects, which have relevance to national needs, and which will also be relevant for tomorrow's technology.

The Department of Science & Technology plays a pivotal role in promoting Science & Technology in the country. The department has wide ranging activities, ranging from promoting high-end basic research and development of cutting edge technologies on one hand and to service the technological requirements of the common man through development of appropriate skills and technologies on the other.
India has a large cadre of scientists. A large number of R & D institutions have been set up to undertake scientific investigations. These institutions are created to provide the government with basic quantitative and descriptive information in the field of science and technology. Apart from the IITs and universities, the Council of Scientific & Industrial Research laboratories and specialized institutions in science and technology are being funded by the government in order to help take up research in the field (Gupta, 1996).

Science and technology have profoundly influenced the course of human civilization. Science has provided us remarkable insights into the world we live in. The scientific revolutions of the 20th century have led to many technologies, which promise to herald wholly new eras in many fields. Science and technology have been an integral part of Indian civilization and culture over the past several millennia. Very few are aware that India was the fountainhead of important foundational scientific developments and approaches. These cover many great scientific discoveries and technological achievements in Life Sciences, Physical Sciences, Medicine and other areas.

India's traditions have been founded on the principles of universal harmony, respect for all creations and an integrated holistic approach. This background is likely to provide valuable insights for future scientific advances. During the century prior to independence, there was an awakening of modern science in India through the efforts of a number of outstanding scientists. They were responsible for great scientific advances of the highest international caliber.

A number of universities and institutes carried out research, mostly on fundamental aspects of science. Certain industries also had their own research organizations.
Under these circumstances, the Government of India constituted the Board of Scientific and Industrial Research in 1940. The Council of Scientific and Industrial Research was formed in 1942. Since independence there has been a greater emphasis on the provision of additional facilities for the promotion of scientific and industrial research. The most significant development in this sphere has been the establishment of a chain of national laboratories and research institutes in different parts of the country. The establishment of national laboratories and research institutes has a special importance in a country like India. These laboratories and research institutes, the Council of Scientific and Industrial Research have made contributions towards the promotion of fundamental and applied research at a number of institutions and universities (Sharma, 2012).

India has been the forerunner among the developing countries in promoting multi-disciplinary activities in the field of Science and Technology, recognizing the practically unlimited possibility of their applications in increasing agricultural and industrial production, and in improving human and animal life.

This study provides the quantitative and qualitative analysis of the progress of Indian Science & Technology, as reflected in its publications output reported in mainstream national and international journals. The main objective of the present study is to examine the status of Science & Technology in the country, its strong and weaker areas of research, quantity & quality of research output, and dynamics of research across institutions, sectors, geographical regions and subjects. Such a study may prove useful for Indian science planners & policy-makers for gaining macro insights into the country’s Science & Technology system.
1.2 Need for the Study

The assessment of research performance by using scientometric technique, a valuable method for the identification of new scientific and technological knowledge. The growth of literature has become a major concern for the scientists, scholars and library professionals as they have to keep themselves abreast with the new advances in their subject. Publication profile is an indicator of the scientific activity of a country. It was seen from the available literature that a little study was done in this field. Many important observations can be derived by studying scientific publications through their bibliographic features such as the channels of communication, journal titles used for publication, the name and affiliation of author, authorship pattern and collaboration.

Thus the present study “Scientometric Analysis of Indian Science Publication Output as Reflected in Scopus database” is an attempt to examine the main features in the field of Science and Technology.

1.3 Scope and Methodology

The present study is based on India’s Science & Technology research output indexed in SCOPUS International multidisciplinary bibliographical database [www.scopus.com], covering more than 16,000 international peer reviewed journal of the world, during 1997-2011. The cumulative publications, citations, subject areas, institutional collaborations, international collaboration and H-index of 15 years (1997 to 2011) have been taken.

In this study, we examine the status and progress of Indian research output of Science & Technology. This study also identifies the factors underlying its growth, stagnation and decline. It also examines India’s position vis-à-vis select developed and developing nations, in terms of its research output, citation visibility.
The study describes the broad features of India’s Science & Technology, in terms of size and growth of its publications output, type of institutions participating in Science & Technology research, their pattern of research output, concentration and scattering of institutional productivity, performance across institutions, sectors, geographical regions and subjects, type of collaboration, and measurement of publications quality in terms of average impact factor and citations per paper. It also profiles the different Science & Technology sectors - the Universities & Colleges, mission-oriented R&D, Institutes of National Importance, and Industry - respectively in terms of publications size & growth characteristics, the role of their constituents, contributions across subjects, quality of research efforts, pattern of collaboration in research, and quantitative & qualitative assessment of research in major participating institutions.

1.4 Objectives of the Study

The objectives of the study are as follows;

1. To measure the year-wise growth of publications of the World and India;
2. To study the domain-wise contributions;
3. To identify the Source of publications;
4. To measure the Indian Scientific Productivity and Collaboration;
5. To rank the Universities and Research Institutes;
6. To rank the journals in science domain and apply Bradford’s Law; and,
7. To suggest a methodology for monitoring the progress of Indian science and Technology in terms of publication output.
1.5 Hypotheses of the Study

The following hypotheses are formulated on the basis of the study of related literature and objectives framed above;

1. There is an increasing trend in the Indian Science and Technology (S&T) publications;
2. Average citations received per paper have improved over the years;
3. Chemistry has been the most preferred area for collaborative research;
4. There is a high degree of correlation between Bio-chemistry, Organic Chemistry and Physical, Inorganic and Analytical Chemistry;
5. Bradford’s law of scattering positively fitted with Science and Technology Literature; and,
6. Research in Science and Technology (S&T) in India is an institutional activity.

1.6 Organization of the Study

The present study has been organized into four chapters as follows:

Chapter 1 - Introduction deals with the introduction, needs, methodology, objectives, and hypotheses of the present study.

Chapter 2 - Review of Related Literature presents a comprehensive review of the related literature for the study in five subheads as: growth of literature; author productivity and collaborations, institutional productivity, science indicators, Journals productivity and obsolescence.

Chapter 3 - Data Analysis and Interpretation provides analysis and interpretation of data under major heads: Growth and development, productivity and collaboration, productivity of Journals, productivity of scientific institutions of Indian science literature.
Chapter 4 - A model for monitoring the progress of Indian Science and Technology Policy deals with database on Indian Science publications, balanced in the coverage of both local and international journals, to present a total picture of India in Science & Technology.

Chapter 5 - Findings and Conclusion gives a brief summary of the findings, areas of further research and conclusion.
References


