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A study of the interrelationship of science and technology and its impact on Indian society

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Abstract
"The science of today is the technology of tomorrow."

- Edward Teller

Science and Technology have always been an integral part of Indian culture. Natural philosophy, as it was termed in those ancient times, was pursued vigorously at institutions of higher learning. The Indian Renaissance, which coincided with our independence struggle, at the dawn of 1900s witnessed great strides made by Indian scientists. This innate ability to perform creatively in science came to be backed with an institutional setup and strong state support after 1947. Since then, the Government of India has spared no effort to establish a modern Science and Technology infrastructure in the country. The Department of Science and Technology plays a pivotal role in promotion of science and technology in the country. This research study deals with the deepening relationship between science and technology and its impact on society, and offers an overview of the policy responses to this relationship, with an advancement in its various fields.

Keywords: Science, technology, interrelationship, impact, society, advancement

Introductions
"It is an inherent obligation of a great country like India with its traditions of scholarship and original thinking and its great thinking, and its great cultural heritage to participate fully in the march of science, which is probably mankind's greatest enterprise today."

-Jawaharlal Nehru

Bridging science with society and reaching developments of science and technology to every stratum of the social system, and making scientists aware of the concerns and expectation of general public is the key for conflict free harmonious sustainable development and economic growth in a democratic plural society. India, right after independence, committed to developing scientific temper as one of the fundamental pillars of modernisation.

Statement of the problem: How do Science and Technology relate?
Science is the study of the natural world by collecting data through a systematic process called the scientific method. And technology is where we apply science to create devices that can solve problems and do tasks. Technology is the application of science. Scientific knowledge and methodologies themselves provide a major source of input into the development of technological practices and outcomes. They are also key tools in the establishment of explanations of why technological interventions were, or were not, successful. Science can provide powerful explanations for the why and why not behind technological intervention. Technological practices, knowledge and outcomes can provide mechanisms for science to gain a better view of its defined world, and in fact can provide serious challenges to the defining of that world.

The Relationship between Science and Technology
1. New knowledge which serves as a direct source of ideas for new technological possibilities.
2. Source of tools and techniques for more efficient engineering design and a knowledge base for evaluation of feasibility of designs.
3. Research instrumentation, laboratory techniques and analytical methods used in research

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that eventually find their way into design or industrial practices, often through intermediate disciplines.
4. Practice of research as a source for development and assimilation of new human skills and capabilities eventually useful for technology.
5. Creation of a knowledge base that becomes increasingly important in the assessment of technology

in terms of its wider social and environmental impacts.
6. Knowledge base that enables more efficient strategies of applied research, development, and refinement of new technologies.

Data collection and analysis

Table 1: Advancements in the various fields of Science and Technology

Field of Advancement	Previous Advancements	Current Advancements
Education	Smart-classes, Distance Education	E-learning, Empowering students with the Aakash Tablet
Engineering & Technology	India's first supercomputer- the PARAM 800 in 1991, Creation of Fibre optics	Concepts like E-governance, UIDAI or Aadhar card Broadband with better speed, 5G technology on the way
Child Health And Care	Subhash Mukhopadhyay - saved life to India's first and the world's second IVF baby-Durga-3rd October 1978	Stem cell banking, Sohum – The new-born hearing screening device (2017)
Space Technology	The first satellite –Aryabhatta-1975	HysIS satellite launched on PSLV-C43 - November 2018
Medical And Health Sciences	Robotic Cardiac Surgery- 2002: Dr. Naresh Trihan, Fortis Escorts Heart Institute, Delhi	Made-In-India Defibrillator -can save heart patients during power cuts (2017) Asia's first upper-arm double-hand transplant done in Kerala (2017)
Agricultural Technology	Temperature and moisture sensors, Agricultural Robots	Organic farming, Skymet is India's largest weather monitoring and agri-risk solutions

Some of the recent developments in the field of science and technology in India:
- In December 2020, Ambassador of France, Germany and the European Union announced that they will together work out a detailed plan to fund more eco-friendly projects in Kerala in the coming years.
- In November 2020, the Engineering Exports Promotion Council India and the National Institute of Design collaborated to promote and upgrade designs and technology for the medical devices industry, enabling it to meet the emerging needs of the country's health sector, particularly in the aftermath of COVID-19.
- In November 2020, Union Cabinet, chaired by the Prime Minister, Mr. Narendra Modi signed a memorandum of understanding (MoU) between the Indian Institute of Astrophysics (IIA), Bengaluru, and the Instituto de Astrofisica de Canarias (IAC) and the GRANTECAN, S.A. (GTC), Spain to develop scientific and technical collaborations in astronomy field.
- On October 10, 2020, Council of Scientific and Industrial Research (CSIR) and KPIT successfully ran trials of India's first hydrogen fuel cell (HFC) prototype car running on an indigenously developed fuel cell stack at CSIR-National Chemical Laboratory, Pune.
- On October 8, 2020, the Union Minister of Education, Mr. Ramesh Pokhriyal 'Nishank', inaugurated the Gyan Circle Ventures, a MeitY funded Technology Business Incubator (TBI) of Indian Institute of Information Technology, Sri City (Chittoor), Andhra Pradesh, to foster innovation and entrepreneurial spirit in institutions.
- On October 6, 2020, Indian Farmers Fertiliser Cooperative Limited (IFFCO) and Prasar Bharati signed a MoU to broadcast and promote new agriculture technology and innovations.
- In October 2020, Department of Science & Technology (DST) and IBM India announced collaborations to scale two DST initiatives—Vigyan Jyoti and Engage with Science (Vigyan Prasar)—that are aimed to increase the number of women working in technology fields.

- In October 2020, in line with Atmanirbhar Bharat to achieve complete self-reliance, C-DAC signed a MoU with National Supercomputing Mission Host Institutes to establish supercomputing infrastructure in various premier institutions across India and accelerate the pace of research and innovation using computational science techniques.
- In October 2020, Prime Minister, Mr. Narendra Modi, inaugurated RAISE 2020, a mega virtual summit on Artificial Intelligence (AI), to exchange ideas on using AI for social transformation, inclusion, and empowerment in areas such as healthcare, agriculture, education and smart mobility and others.
- In October 2020, Ministry of MSME implemented artificial intelligence (AI) and machine learning (ML) on its robust single window system, 'Champions', to provide assistance and solutions to issues.
- Global impact of the COVID-19 pandemic has led to two major resets or shifts – an acceleration in the pace of digital transformation and a novel, hybrid work model that has redefined the dimensions of already evolving workplace and work culture.

Findings and conclusion
Changes in Society Due To Scientific and Technological Progress
Scientific and technological progress has had various effects on society. These effects have not been limited to the improvement of society's material wealth, but have also extended to altering the paradigms under which society operates. Information and telecommunications technology (IT) is one example of a paradigm-changing technology. Progress in energy and materials technologies has given rise to a variety of new transport modes, such as the railroad, the automobile, and the airplane, vastly improving human mobility in terms of both time and space. Inventions in machine tools have also been linked to advances in energy technology to achieve automation and acceleration of manufacturing processes. The result has been large-volume production of goods in ever-shorter periods of time. Moreover, progress in materials technology has resulted in

the ability to produce diverse types of material items. Meanwhile, progress in medical technology has greatly extended people's average life spans and reduced infant and child mortality rates, resulting in a dramatic rise in the world's population.

Impact of Science and Technology on society
Science and technology have had a major impact on society, and their impact is growing. By drastically changing our means of communication, the way we work, our housing, clothes, and food, our methods of transportation, and, indeed, even the length and quality of life itself, science has generated changes in the moral values and basic philosophies of mankind. Beginning with the plot, science has changed how we live and what we believe. By making life easier, science has given man the chance to pursue societal concerns such as ethics, aesthetics, education, and justice; to create cultures; and to improve human conditions.

Suggestions
1. To promote technological advances, developing countries should invest in quality education for youth.
2. Continuous skills training for workers and managers, and it should be ensured that knowledge is shared as widely as possible across society.
3. The only form of investment that allows for increasing returns is in building the stocks and flows of knowledge that a country or organization needs.
4. New insights and techniques should be encouraged.

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