

The Role of Science and Technology in Strengthening National Power and Global Credibility

Faezeh Moosavi-Movahedi¹, Ali A. Moosavi-Movahedi^{1,2}, Reza Yousefi^{*,1}

Article Info

Article type:

Popularization of Science

Article history:

Receive Date:

02 January 2026

Revise Date:

12 February 2026

Accept Date:

14 February 2026

Available online:

6 May 2026

Keywords:

Science and technology
hard power
soft power
smart power
national branding
science diplomacy
geopolitical power

Science and technology in the modern era are among the fundamental pillars of national power and diplomacy and constitute some of the most valuable assets of nations. Science seeks to achieve an accurate, systematic, and reproducible understanding of the world, whereas technology transforms this knowledge into practical and purposeful tools and solutions. Moreover, these two domains reinforce each other through a dynamic and synergistic cycle: scientific advances lead to the development of new technologies, while technological innovation, by providing more precise tools, enables the expansion and deepening of scientific knowledge. Examples such as the transition from quantum physics to the invention of the transistor and modern computers, as well as the discovery of the structure of DNA and the subsequent development of biotechnology, clearly demonstrate how fundamental knowledge can be transformed into economic and social power. Science and technology simultaneously strengthen both hard power and soft power, thereby contributing to the formation of smart power. Countries often leverage science and technology when seeking to rebuild their national brand, enhance their international credibility, or establish a stronger position in economic and geopolitical competition. Investment in education and research, scientific infrastructure, and science and technology diplomacy can gradually transform scientific achievements into cultural attractiveness, political and social influence, and a source of national pride.

Cite this article: Moosavi-Movahedi, Faezeh; Moosavi-Movahedi, Ali A.; Yousefi, Reza. (2026). The Role of Science and Technology in Strengthening National Power and Global Credibility. *Science Cultivation*, 16 (1).pp.17-26.



© Author(s) retain the copyright and full publishing rights.

Publisher: Foundation for the Advancement of Science and Technology in Iran (FAST-IRAN) and Iran Society of Biophysical Chemistry (ISOBC)

* Corresponding Author. Professor. Tel: +982161113378, Fax: +982166404680, E-mail: Yousefi.reza@ut.ac.ir

¹ Institute of Biochemistry and Biophysics, University of Tehran, Tehran, Iran

² Division of Chemistry, Academy of Sciences I.R. Iran, Tehran, Iran

Extended Abstract

The Role of Science and Technology in Strengthening National Power and Global Credibility

Introduction

In contemporary global order, science and technology have transcended their traditional role as drivers of economic development to become foundational pillars of national power and essential instruments of modern diplomacy. Science provides systematic, testable, and self-correcting knowledge about the world, while technology transforms this knowledge into practical, repeatable, and goal-oriented tools and systems. These two domains form a dynamic, mutually reinforcing cycle: scientific breakthroughs enable novel technologies, which in turn provide more precise instruments for advancing scientific discovery.

This virtuous cycle has produced transformative historical examples, including the journey from quantum physics to transistor and modern computing, and from the discovery of DNA structure to recombinant DNA technology and genetically modified organisms (GMOs). Such cases illustrate how fundamental knowledge can rapidly translate into profound economic, military, and societal power.

Theoretical Framework Drawing on Joseph Nye's paper analyzes the contribution of science and technology to three interrelated dimensions of power:

- **Hard power** — through advanced weapon systems, superiority in critical supply chains (e.g., semiconductors), and economic dominance via technological standards and export controls
- **Soft power** — via enhanced national attractiveness, prestige, cultural credibility, and science diplomacy
- **Smart power** — the strategic integration of hard and soft resources to produce more flexible, legitimate, and sustainable influence

Today, technology is no longer merely a means of national development; it has become a primary pillar of geopolitical competition and a central factor in redefining the global balance of power.

Science and Technology in Hard Power The military–industrial significance of science became fully institutionalized during World War II and the Cold War, with massive state-funded “big science” projects (radar, penicillin, etc.). In recent decades, dual-use technologies (AI, quantum computing, 5G, biotechnology) and the spin-on phenomenon (civilian innovation feeding back into military applications) have blurred the boundary between civilian and defense R&D.

Economically, leadership in strategic technologies determines control over **global value chains**, standards, and intellectual property. The ongoing **U.S.–China technology discourse** especially regarding semiconductors, AI, and 5G exemplifies how technological superiority translates into economic coercion.

China's rapid ascent from marginal scientific player in 1949 to the world's second-largest R&D investor and leader in patent filings and high-impact publications (especially since the mid-2000s) vividly demonstrates the possibility of deliberate, state-led transformation of scientific-technological capacity into comprehensive national power.

Science and Technology in Soft Power and National Branding advanced science and technology significantly contribute to **national branding** and international prestige. Three paradigmatic success stories are examined:

- **Japan** — rebuilt its post-war image from militaristic to peaceful, high-quality, and technologically sophisticated through (Sony, Toyota), science diplomacy, and the “Society 5.0” vision.
- **South Korea** — combined cutting-edge digital infrastructure with the global **Hallyu** (Korean Wave) cultural export to create a modern, creative, and attractive national identity.
- **Germany** — leveraged scientific excellence, engineering reputation, and value-based foreign cultural policy to transform from post-Nazi pariah to respected normative power and Europe's innovation hub.

These cases illustrate that sustained investment in R&D, coupled with effective cultural narrative and science diplomacy, can generate durable soft-power capital even in the absence of overwhelming hard-power resources.

Science Diplomacy and International Scientific Prestige Scientific leadership enhances international credibility and facilitates agenda-setting in global institutions. Countries elevate their standing through sustained R&D investment ($\geq 2.5\text{--}5\%$ of GDP), high-quality and highly-cited publications, international awards, leadership in “big science” projects (CERN, ITER, ISS), and active participation in transnational scientific networks.

Conclusion and Outlook In the 21st century, genuine and sustainable national power increasingly depends on the effective integration of knowledge production, technological competitiveness, and strategic diplomatic exploitation of scientific achievements. Nations that master this triad (transforming material resources into intangible assets of scientific prestige, technological sovereignty, and attractive national identity) are best positioned to shape the future global order. For developing countries, the transition from reliance on tangible assets toward investment in high-quality science, talent retention, international academic collaboration, and active science diplomacy constitutes the most viable long-term path toward enhanced international standing, resilience, and both hard and soft dimensions of national power. Iran, can leverage its rich language and literature, traditional art, culinary culture, and historical attractions as highly valuable assets while simultaneously leveraging its scientific and technological capabilities more effectively. This approach can enhance its soft power and cultural appeal globally, facilitate the transformation of tangible and intangible assets into highly valuable assets, strengthen the country's international credibility, influence, and deterrence, and position Iran in the modern global creative arena while simultaneously enhancing its attractiveness and standing on the world stage.