



The knowledge economy: India's engine for a \$ 10 trillion future

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Abstract

As the global economic center of gravity shifts toward intellectual capital and digital ecosystems, India stands at a critical juncture. To transition from a \$ 4.3 trillion economy to a \$ 10 trillion powerhouse by 2035. Traditional manufacturing and service models must be superseded by a "Knowledge Economy" framework. This article explores the four pillars of this transition: Innovation and R & D, Digital Public Infrastructure (DPI), Human Capital Development, and Manufacturing in the knowledge age. By analysing current trajectories in deep tech, the National Education Policy (NEP) 2020, and the Startup ecosystem, this paper argues that India's path to \$ 10 trillion is predicted on its ability to democratize knowledge and scale innovation.

Keywords: \$ 10 Trillion economy, digital public infrastructure, human capital, innovation knowledge economy, sustainability

Introduction

The global economic paradigm has shifted from labour-intensive production to knowledge-intensive value creation. For a developing giant like India, the quest for a \$ 10 trillion economy is not merely a numerical target but a structural transformation with a GDP currently hovering around \$ 4.2 trillion to \$ 4.3 trillion reaching the \$ 10 trillion mark requires a sustained real growth rate of approximately 8.5%. India is current the world's fastest growing major economy. However, reaching the \$ 10 trillion milestone requires more than incremental growth, it necessitates a structural metamorphosis. The traditional "demographic dividend" is a time-bound asset that can only be realised if the workforce is transitional from low-productivity labour to high-value knowledge work.

A knowledge economy is defined by an economy where growth is driven by the quantity, quality, and accessibility of information rather than just physical resources or low-cost labour. For India, this means shifting the focus from being the "back office of the world" to becoming the "R&D lab of the world". India can leverage its demographic dividend-with over 65% of its population in the working-age bracket and its leadership in Information Technology to move up the value chain. Historically, nations like China utilized labour-intensive manufacturing to propel themselves out of poverty. While India's "Make in India" initiative attempts to replicate aspects of this model, the window for low-cost manufacturing is closing due to automation and protectionism. Consequently, India's path must be distinct. It must leapfrog directly into a service-led, technology-intensive growth model- a knowledge economy. This paper explores the four pillars driving, this transition and the structural anchors weighing it down.

The Innovation and R & D Ecosystem

To reach \$ 10 trillion, India must increase its Gross Expenditure on R & D (GERD), significantly lower than the 2-3% spent by developed economics like the US, Korea, or Israel. Currently, India spends roughly 0.65% to 0.7% of its GDP on R&D.

a. The Rise of "Deep Tech" Startups

Despite low public spending, the private sector-specifically the startup ecosystem-is stepping up. India is now the third

largest startup hub globally. The focus is shifting toward "Deep Tech" Space Tech (spurred by ISRO's successes)

- Quantum computing, and Green Hydrogen. The Anusandhan National Research Foundation (ANRF) is designed to bridge this gap by funnelling Rs. 50,000 crores into research over the next five years, with 70% expected from private sector.
- The RDI scheme Fund introduced of Rs. 1 lakh crore fund for Research Development and Innovation (RDI) signals a shift towards private sector led innovation.

The AI Revolution: Scaling Intelligence

Artificial Intelligence is no longer a luxury but a core utility in the Indian context, with the India AI Mission (budgeted at over Rs 10, 300 crore), the government is treating AI as a "Force Multiplier" for the economy.

a. AI in Agriculture and Healthcare

In a knowledge economy, AI bridges the gap between expert knowledge and local application.

- **Agriculture:** AI-driven predictive modeling helps 140 million farmers mitigate climate risks, optimizing crop yields and reducing waste, which is essential for transforming a \$ 400 billion sector into high-value industry.
- **Healthcare:** AI diagnostics are being deployed in rural districts to catch disease like tuberculosis and cervical cancer early, effectively "downloading" the expertise of top-tier doctors into affordable handheld devices.

b. The Economic Multiplier

Estimates suggest that AI could add approximately \$ 1.2 to \$ 1.7 trillion to India's GDP by 2035. By moving from being service providers to protect owners on the global stage.

Human Capital: Reforming the Knowledge Pipeline

The success of a knowledge economy depends entirely on the quality of human capital. India's demographic dividend-with a median age of 28- is a double-edged sword. Without a shift from rote learning to skill-based education, this dividend risks becoming a demographic disaster.

a. The New Education Policy (NEP)

The NEP 2020 and subsequent reforms in 2024-25 focus on:

- **Vocational Integration:** Introducing coding and vocational skills at middle-school level.
- **Higher Education Flexibility:** Allowing multiple entry and exit points to encourage lifelong learning.
- **Industry-Academia links:** Incentivizing R & D partnership between universities and the private sector to move beyond “Paper publishing” toward “patent-filing”.

Manufacturing in the knowledge age: “Make in India 2.0”

Knowledge-driven growth is not limited to the services sector. High-tech manufacturing is the intersection of physical production and intellectual property.

- **Semiconductor:** With the India Semiconductor Mission, the country aims to become a global hub for chip design and fabrication, a critical requirement for national securing and digital sovereignty.
- **Healthcare and Pharmaceuticals:** India has been recognized as the “Pharmacy of the world” as the world’s largest vaccine producer, out of total worldwide production 60% vaccine production is in India. The nation also accounts for over 20% of the global supply of generic pharmaceuticals. It is due to combine with continuous R & D and innovation. So, it is considered that the pharmaceutical market in India is expected to grow at a CAGR of 5.92%, reaching a valuation of % 88.86 billion by 2030.
- **Electric vehicles:** India is now leading Asia’s EV revolution. EVs are starting to make their mark on the nation’s economy because of steady sales growth. In 2024, electric car sales reportedly increased by 20%. There are various initiatives taken by government like FAME Scheme and the PLI Scheme for Advanced Chemistry Cells.
- **Renewable Energy:** According to the data of December, 2024, it shows that India’s total renewable energy installed capacity reaching 209.44 GW a 15.85 year-on-year increase. As its aims of 500 GW of renewable energy capacity by 2030 with net-zero emissions target by 2070, investment opportunities in solar, wind and energy storage options continue to expand. It is estimated that an 8.7% CAGR would be contributed by India with a valuation of \$46.7 billion by 2032.
- **Agro and Food-processing:** By encouraging R & D in Agro and food processing sector, digital platforms have been facilitated by government for efficient trading with ideal opportunity.

Challenges to the \$ 10 Trillion Dream

Despite the momentum, several structural hurdles remain:

- **The R & D Gap:** Private sector investment in research is still lower than that of global peers like China or the US.
- **Digital Divide:** While urban India is hyper connected, rural “knowledge infrastructure” requires significant investment to insure inclusive growth.

- **Autonomy with certain conditions:** More autonomy with given conditions should be given colleges on reforming the syllabus, quality of education, and recruitment of faculty to create high quality professionals.
- **Regulatory Speed:** Transitioning from “Management Oriented” to “Service-Oriented” governance is crucial for the ease of doing business.
- **Mismatched between Educational Outcomes and Industry need:** Due to Mismatch between Educational Outcomes and Industry needs: There is shortage of skilled workers in emerging technologies (AI, IOT etc.)

Conclusion: The Road to \$ 10 Trillion

The transition to a \$ 10 trillion economy is not a linear progression, it is a structural transformation. By 2035, the service sector is expected to contribute nearly 60% of India’s GDP, but its character will be unrecognizable from the past. It will be a sector defined by AI-driven exports, digital financial services, and high-value intellectual property. To ensure this future, India must:

- Increase R & D spending to at least 1.5% of GDP by 20230.
- Close the skill gap for the 50 million people expected to enter the workforce with inadequate digital literacy.
- Strengthen IP laws to protect and encourage domestic innovation.

The engine is primed. If India continues to prioritize its digital and intellectual infrastructure, the “knowledge Economy” will not just be a sector-it will be the very fabric of a new, global economic superpower.

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