

**From Developing India@75
to
Developed Bharat@100**

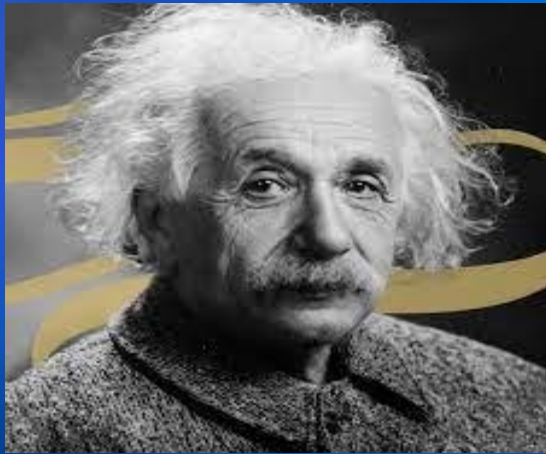
R. A. Mashelkar, FRS
21 November 2023

What is the Most Powerful Equation?



Newton

$$F = ma$$



Einstein

$$E = mc^2$$

None of the above?!

Most Powerful Equation

$$E=F$$

Education = Future

Proof of $E=F$ on 17 March 2000



Ratan Tata and I, a Tata scholar, received Padma Bhushan (2000) at the hands of the then President, K. R. Narayanan, another Tata scholar.

Mother in Bharat@75 Preparing her Daughter For Bharat@100



Right to Education

Right Education

Right Way of Education

Online Learning - The only way of education
during the COVID-19 pandemic

India@75

Digitally Empowered 8-Year-Old Ved Gujar



Bharat@75 - Digitally Deprived Students Committing Suicide for Not Being Able to Attend Online Classes

Punjab

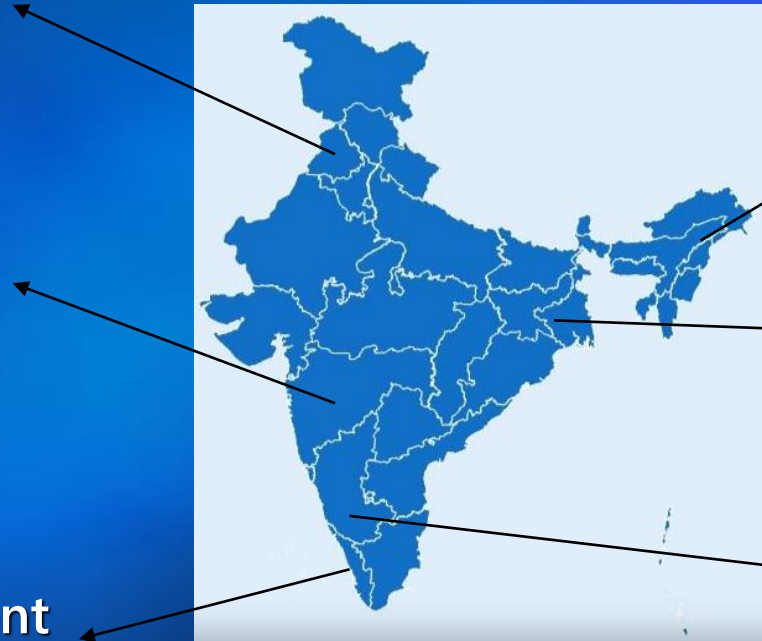
Class 11 Student

Maharashtra

15-year-old girl

Kerala

16-year-old student



Assam

15-year-old student

West Bengal

Class 10 Student

Karnataka

15 year-old student

Maharashtra: No smartphone to attend online classes, 15-year-old girl commits suicide

Police said the girl had been going to a classmate's house to attend online classes, but wanted her own phone. Because of loss of employment during the lockdown, the family had been facing financial issues.

By: [Express News Service](#)

Pune | Updated: October 1, 2020 12:29 IST



The incident took place in Ond village in Karad taluka of Satara district

Bharat and India – They live next to each other!

India among top countries with high income, wealth inequality: UNDP report

3 min read • 06 Nov 2023, 09:31 PM IST

mint

The 2024 Asia-Pacific Human Development Report, launched on Monday, paints a qualified picture of long-term progress but also persistent disparity and widespread disruption



India@75



Bharat@75

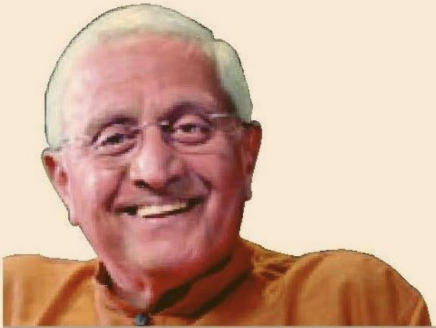
Continuous Rise in Inequality in the Last 60 Years

Average Share of Wealth by Economic Group in India, 1961- 2020

| Year | Average Share of Wealth of Bottom 50% | Average Share of Wealth of Top 10% | Average Share of Wealth of Top 1% |
|-----------|---------------------------------------|------------------------------------|-----------------------------------|
| 1961-1970 | 12.29% | 43.18% | 11.87% |
| 1971-1980 | 11.75% | 42.25% | 11.23% |
| 1981-1990 | 10.91% | 45.00% | 12.50% |
| 1991-2000 | 8.36% | 54.57% | 23.31% |
| 2001-2010 | 8.10% | 56.60% | 25.70% |
| 2011-2020 | 6.12% | 63.68% | 31.55% |

Note: The data is obtained from the World Inequality Database. The average wealth share is computed by a simple arithmetic average of annual wealth shares.

Cumulatively ravaging effects of inequality



BUSINESS & PURPOSE

R GOPALAKRISHNAN

Everywhere in the world malaises are common: Worker insecurity, crony capitalism, political bribery, racism, and, more broadly, inequality. I was born when India was ruled by Lord Wavell. Our generation was inspired by leaders who served jail sentences to win independence, though, after independence, most of us sought a different life for ourselves and our country. Similarly, the children of liberalisation admire those who worked incredibly

of inequality. Indian American author and economist Ravi Batra, a cohort of my generation, had argued four decades ago in *The Great Depression of 1990* that free-flowing capitalism creates excessive inequality and breeds political corruption.

Inequality has many manifestations: Economic, gender, religion, class, caste, and culture. The ill effects may be episodic, as with economic matters, or long-lasting, for example, as with caste. Each manifestation of inequality derails progress; collectively they can devastate societies. Perhaps the world, and surely India, is suffering the “convergent slings of multiple ravaging”. When I string together recent events and episodes, buttressed by writings of commentators, I see a pattern.

First — a reference to gender inequality. The woman Prime Minister of Iceland joined a public strike to draw the nation’s attention to the widespread gender-based pay gap and sexual violence — Iceland, whose image in the world is of gender equality! Centuries earlier, Draupadi’s invective on her *vastraharan*

that narrative would distract readers from the thrust of this article.

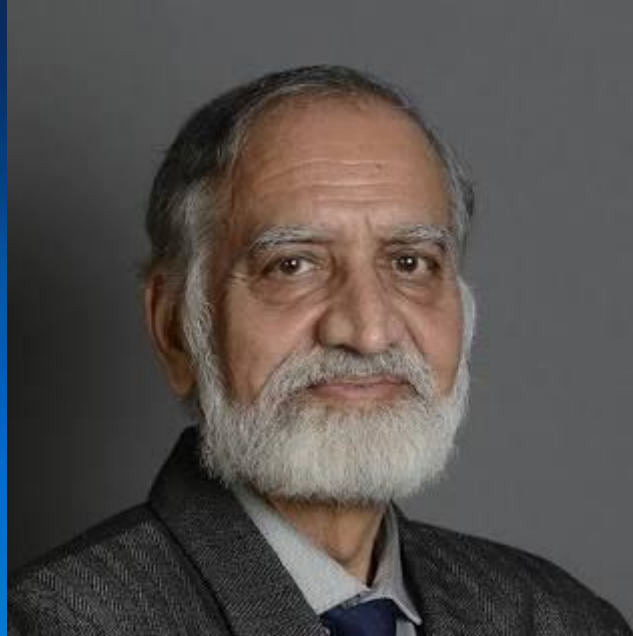
Second — inequalities due to caste. Social reform movements had iconic leaders like Jyotiba Phule in Maharashtra, Sri Narayana Guru in Kerala, Madhusudan Das in Odisha, and EVR Periyar in Tamil Nadu. B R Ambedkar argued that caste must be “annihilated” for true benefits of political and economic reform to accrue to the mass of the people. His use of the word “annihilated” prompted Mahatma Gandhi to describe him as “a challenge to Hinduism”. In modern times, DMK leader Udhayanidhi Stalin said something similar, though his comment misfired.

Third — inequalities in the cultural world. Take, for example, the strike by Hollywood technicians, writers, and actors. Threatened by technology and aggrieved by a widening disparity in earnings, the strikers feel insecure about their self-worth and future. The “winner-takes-all” stars aggravate the overwhelming sense of unfairness. In early 2023, the Walt Disney Company Board received a

Labour”, *NYT*, July 23, 2023; and “Exhausted Amazon staff fight back against retail giant”, *The Guardian*, October 22, 2023). Australian airline Qantas sacked 1,700 workers — illegally, according to reports. When the board subsequently placed a proposal for “fair” executive pay, shareholders voted against the proposal. Clearly something is amiss and getting worse. We require sensitivity and compassion to appreciate the nuances of what is happening. For corporate leaders, it is important not only what you say but how you say it. If you cannot decrease inequality, try not to increase it! If a corporate honcho is awarded 2,500 times the median pay of workers, he or she is inviting adverse attention. During my service years, the ratio in India was not so acute; it appears to be a new trend.

Are the nomination and remuneration committees (and boards as a whole) monitoring this fact carefully and closely enough? Boards of sustainable, humane, and enlightened (SHE) companies should take stock of such leadership vectors. As stated in my recent book *Inside the Boardroom*, directors

Kiran Karnik Explains the Ravaging Effect of Inequalities at Birth!



Thanks, Gopal: very well put. “Ravaging” effects, indeed.

For too many, the inequality of opportunity begins at birth and then continues to amplify. Birth-identity creates amazing inequities: the tribal/ST(caste) girl (gender) born in a village in Jharkhand (geography), to poor parents (class) is doomed. That a few yet overcome these four uncontrollable (for the individual) disadvantages is a tribute to the particular person and not a virtue of our system.

Warm regards,

Kiran

**Can we create the Magic of Access Equality
Despite Income Inequality?**

Gandhian Engineering!
More from Less for More People (MLM)
ATSE Innovation Forum Lecture in Canberra, 2008



Inspiration for Gandhian Engineering

Mahatma Gandhi said:

“Earth provides enough to satisfy every man’s need, but not every man’s greed”

MORE FROM LESS

“I would prize every invention of Science made for the benefit for all”

FOR MORE

Gandhian Engineering

Getting More (performance)

From Less (resource)

For More (people)

MLM

Income Inequality 1000 : 1 ?



Access Equality 1:1!

MLM - Access Equality Despite Income Inequality

- High Quality Hepatitis B vaccine – 40X cheaper...
- High Quality Cataract Eye Surgery – 100X cheaper...
- High Quality Open Heart Surgery - 20X cheaper...
- High Quality Artificial Foot – 300X cheaper...

No dreams, India has done it!

MLM Mantra
Spreading Around World

WORLD ECONOMIC FORUM

The logo of the World Economic Forum, featuring a blue arc that starts to the left of the word 'WORLD', curves around the word 'ECONOMIC', and ends to the right of the word 'FORUM'.

COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

Special Session
More From Less For More
16 Nov 2010

Message of Gandhian Engineering spread around the World with Missionary Zeal...



Anjani Mashelkar Inclusive Innovation Award

Access Equality
Despite
Income Inequality

Affordability

Accessibility

Adaptability

Anjani Mashelkar Prize - Past Winners

2022



Narayana Rao,
Manmohan,
Venkat
Swaasa

2021



Subhash
Narayanan
OralScan

2020 (COVID)



Mudit Dandwate,
Gaurav Parchani
Dozee

2020 (Non-COVID)



Senthil
Murugesan
SaveMom

2019



Vimal Govind,
Rashid K
Bandicoot

2018



Vinay Kumar
anuPath

2017



Navin Khanna
Dengue Day 1 Test

2016



Mihir Shah
iBreastExam

2015



Rahul, Neha
Rastogi
Sanket

2014



Jairaj Chintamani
Diasense

2013



Leo Mavley
AxioStat

2012



Myshkin Ingawale
TouchHb

2011



Bhawana Chanana
Low-Cost Diapers

2011



Shyam Vasudev
3nethra

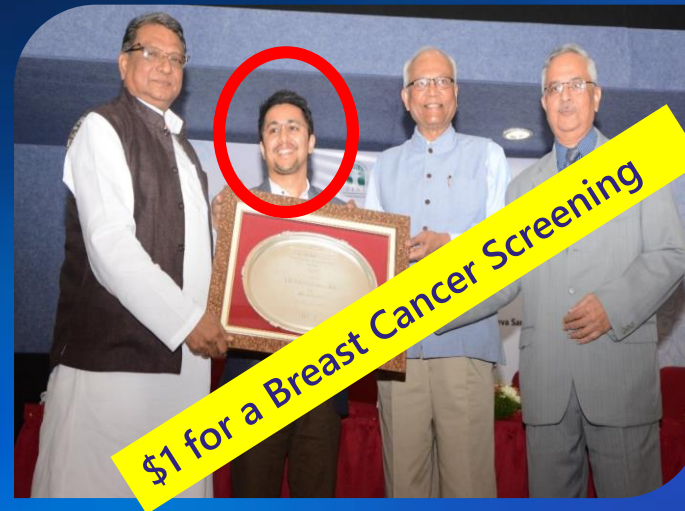
Anjani Mashelkar Prize 2023



Intelligent Health Risk Assessment (IHRA)

BEST Practice to NEXT Practice

Anjani Mashelkar Inclusive Innovation Award



Anjani Mashelkar Inclusive Innovation Award 2022



Swaasa - AI-driven platform technology that assesses respiratory health through audiometric analysis of cough sounds

Swaasa - Best Practice

to Next Practice



| | | |
|-----------------|-------------|---------|
| Equipment Cost | ~ ₹ 100,000 | 0 |
| Assessment Cost | ~ ₹ 1,500 | ~ ₹ 1 |
| Results | 90 Minutes | Instant |

Anjani Mashelkar Inclusive Innovation Award (2012)



Myshkin Ingawale for TouchHb

Rs 10 Non-invasive Hemoglobin Test! (Young Myshkin Ingawale)



Best Practice

Invasive with Needles

Cost per Test – 150 Rupees

Next Practice

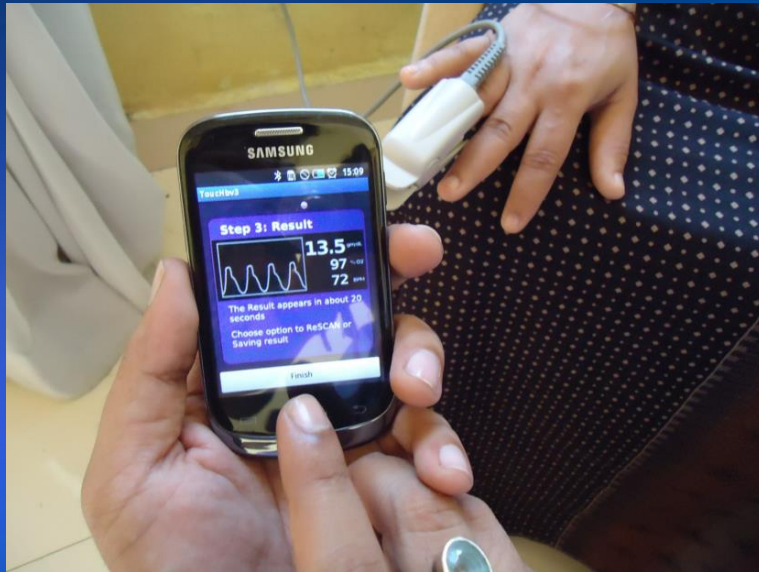
Non-Invasive, No Needles

Cost per Test –10 Rupees

Again, Best to next Practice...

Needle Free and Painless Anaemia Screening in <2 Minutes

TouchHb 1.0



High Technology

Photoplethysmography + Spectrophotometry
+ Advanced Software for Photon Scattering

TouchHb 2.0



Captures the picture of conjunctiva and uses
the method of reflectance photometry to
estimate Hb content in blood

Anjani Mashelkar Inclusive Innovation Award (2016)



Mihir Shah for 'iBreastExam' Device

Best Practice to Next Practice in Breast Cancer Screening Biopsy/Mammography to \$1 Non-invasive Screening

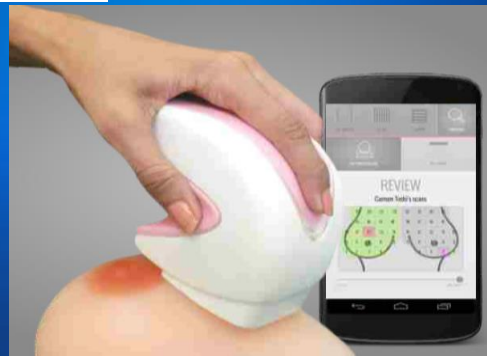
iBreastExam Low cost tactile sensor that measures tissue stiffness difference in real-time, non-invasively and without pain



- Ultra Portable
- Accurate
- Minimal Training
- Wireless
- Cloud Connected
- Instant Results

Presence in 20 countries

Scanned over ~2.5 million women



Making High Technology Work for Poor: Pregnant women in remote villages

- Savemom, an IOT based maternal healthcare solution monitors a mother's health using smart wearables that collect various physiological signals
- 1000 days care to mother and child for Rs. 1000

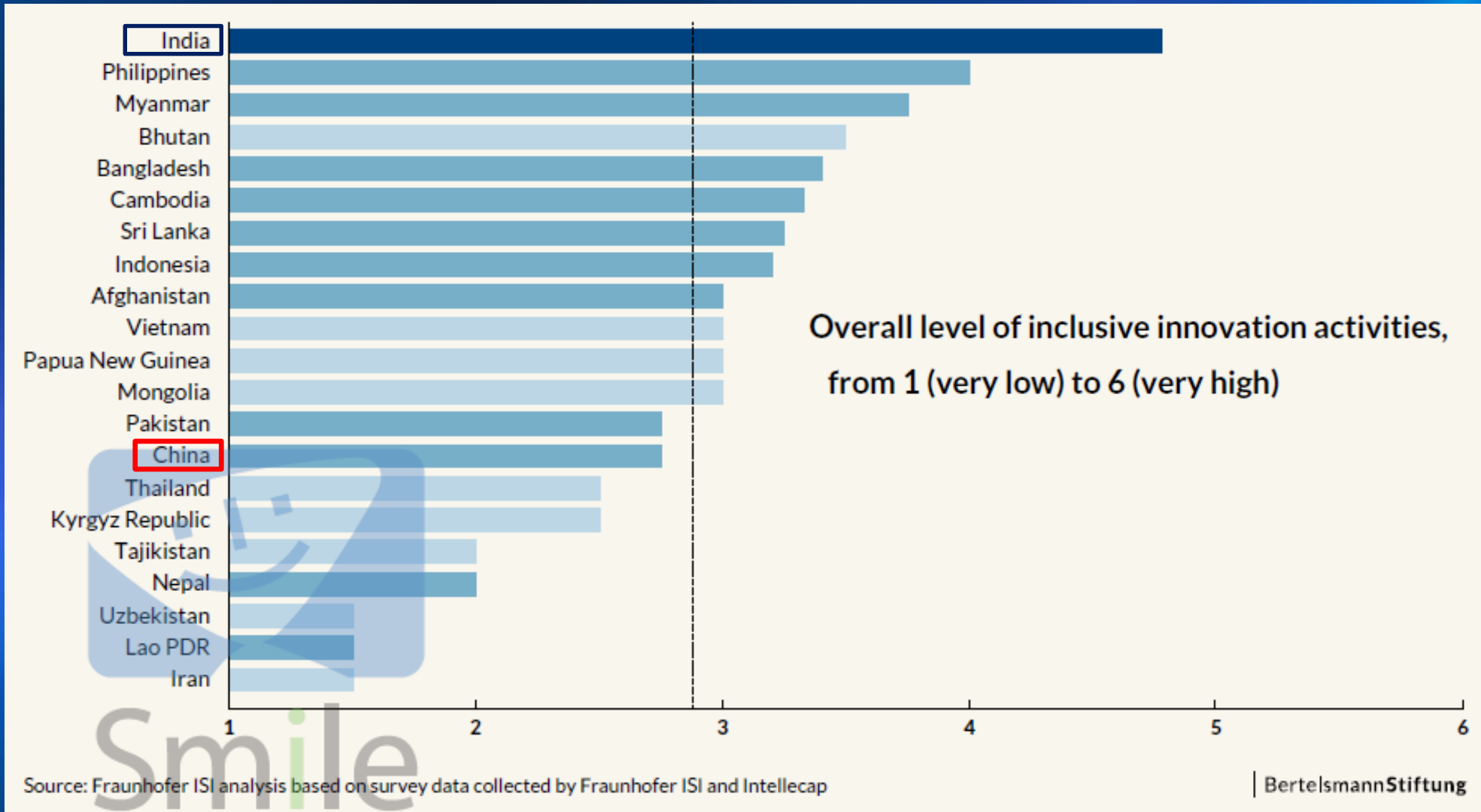


- Onboarded ~3.6 M women across the country on its platform
- 40 % increase in the average weight of newborns
- Harvard Business School case study!



India Leads in Inclusive Innovation in Asia

India is the leader among the 21 countries surveyed in 2019





Innovation's Holy Grail - MLM

C.K. Prahalad & R.A. Mashelkar
Finds place in 10 must read papers in
innovation

Harvard Business Review- July, August 2010

How do we move Business to MLM Creating Access Equality Despite Income Inequality

FROM

- Technologically sophisticated performance rich products with many features
- Remove features to reduce costs
- Premium Price-High Margins
- Technology Push, Product –Out Approach
- Current Markets- Old Money
- Use developed world products to transform emerging markets

TO

- Frugal, functional but high-quality products
- Reinvent the product from ground up
- Affordable Price- High Volumes
- Customer Centric, Market Based Approach
- New Markets- New Money
- Build new global growth platforms based on emerging markets

Jio: A Corporate Doing MLM by Giving Access Equality Despite Income Inequality

| | Before Jio | After Jio |
|-----------------------|------------|----------------------|
| 4G VoLTE phone | \$300 | \$23 (Effective \$0) |
| Data/GB cost | \$5 | \$0.01 |
| Voice expenditure/min | \$1.6 | \$0 |

JioBharat Phone – Made for Bharat

Empowering 250 million 2G mobile subscribers who cannot afford a smartphone



Launched on 3rd July 2023

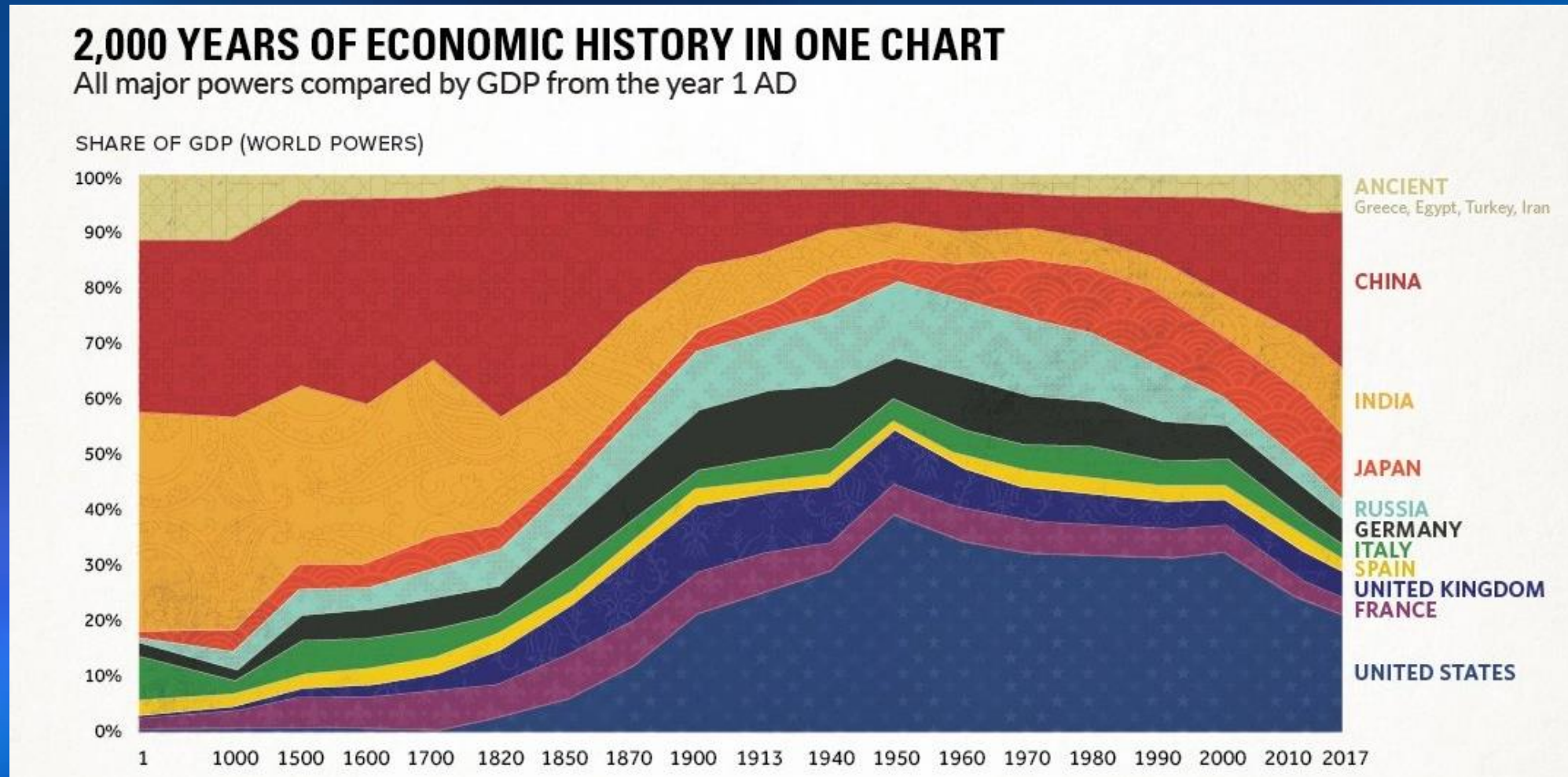


GMES 2023 Opening keynote Address
Bay Area, California on 29th July 2023

Gandhian Young Technological Innovation (GYTI) Awards 2018



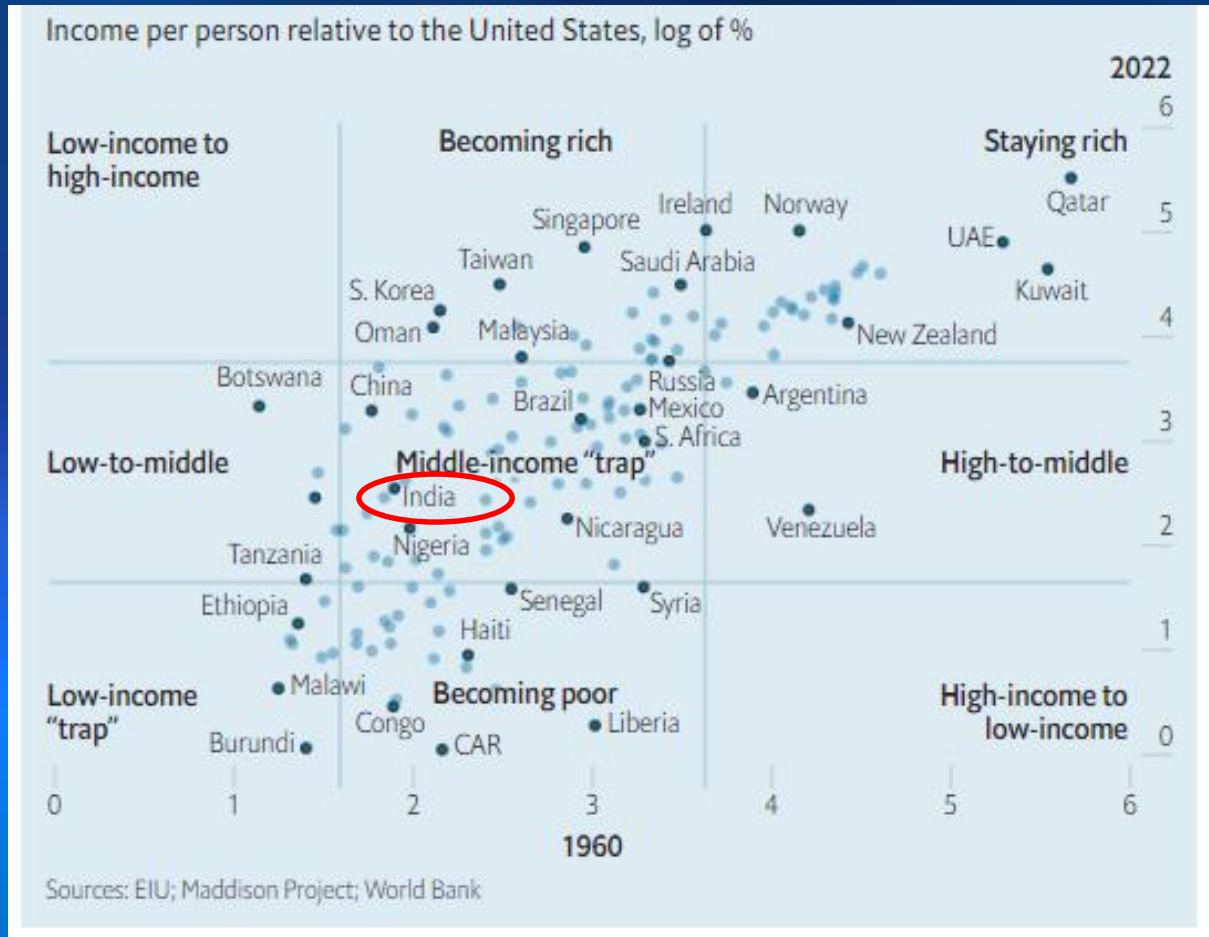
In the 1700s, India's Share of The World GDP was ~25%



In 2022, India's share of the world GDP was ~ 3.4% in nominal terms

India Must Focus On Escaping The Middle-income Trap

The middle-income trap is a concept that describes a situation where a country's economy gets stuck in a middle-income range and struggles to advance to higher levels of development.

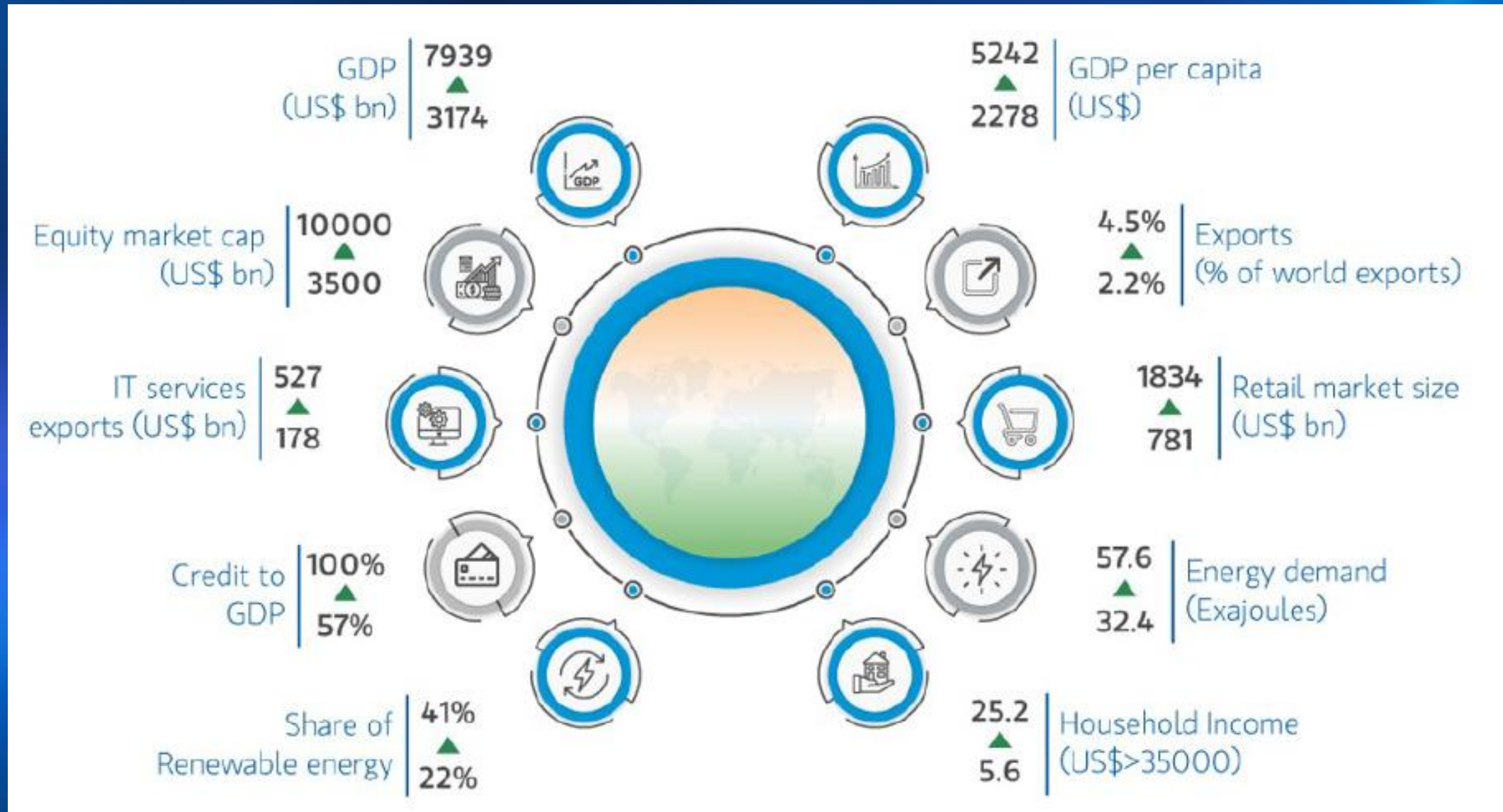


Key Reasons?

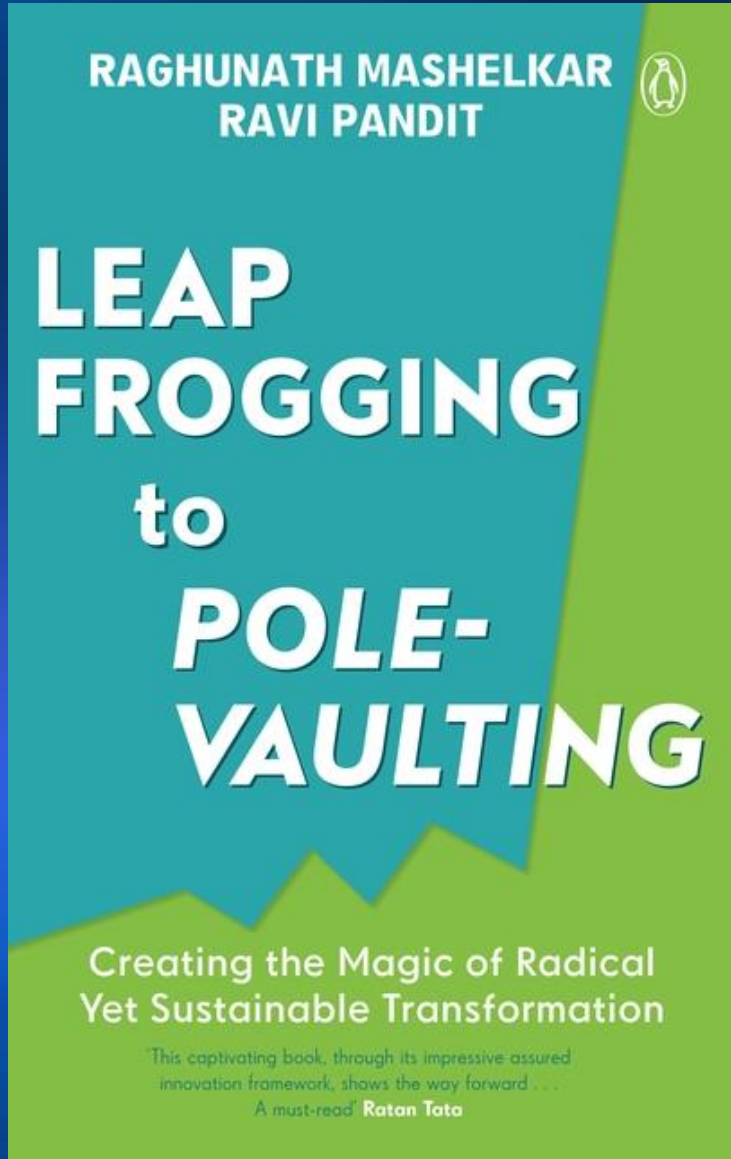
- Declining Competitiveness
- Stagnating Innovation
- Low Productivity
- Institutional Inefficiencies

China expected to escape the middle-income trap by 2025

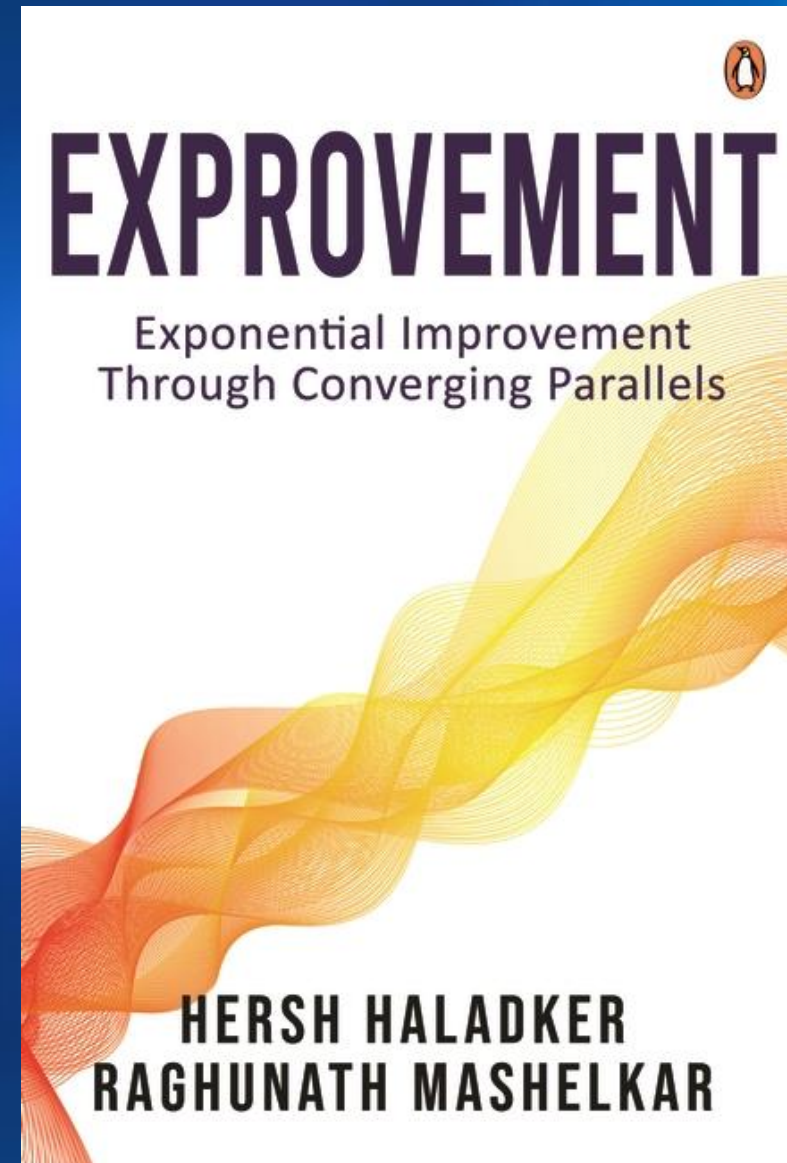
India Will Drive ~20% of Global Growth through End of This Decade



Bharat@100 – Chasing Exponential



<https://www.penguin.co.in/book/leapfrogging-to-pole-vaulting/>



<https://www.penguin.co.in/book/exprovement/>

Exponential Growth Story of a Pond

Day 1

An almost
empty
look!



Lilies in this pond double up every day

Power of Exponential – Lilies in the Pond

Day 30

100% Full



After continuing to double up every day...

But Will Change from Almost Empty To Full in Just 4 Days!

Day 26

Only 6% Full

An almost empty look!



Exponential Pond to an Exponential Real Enterprise

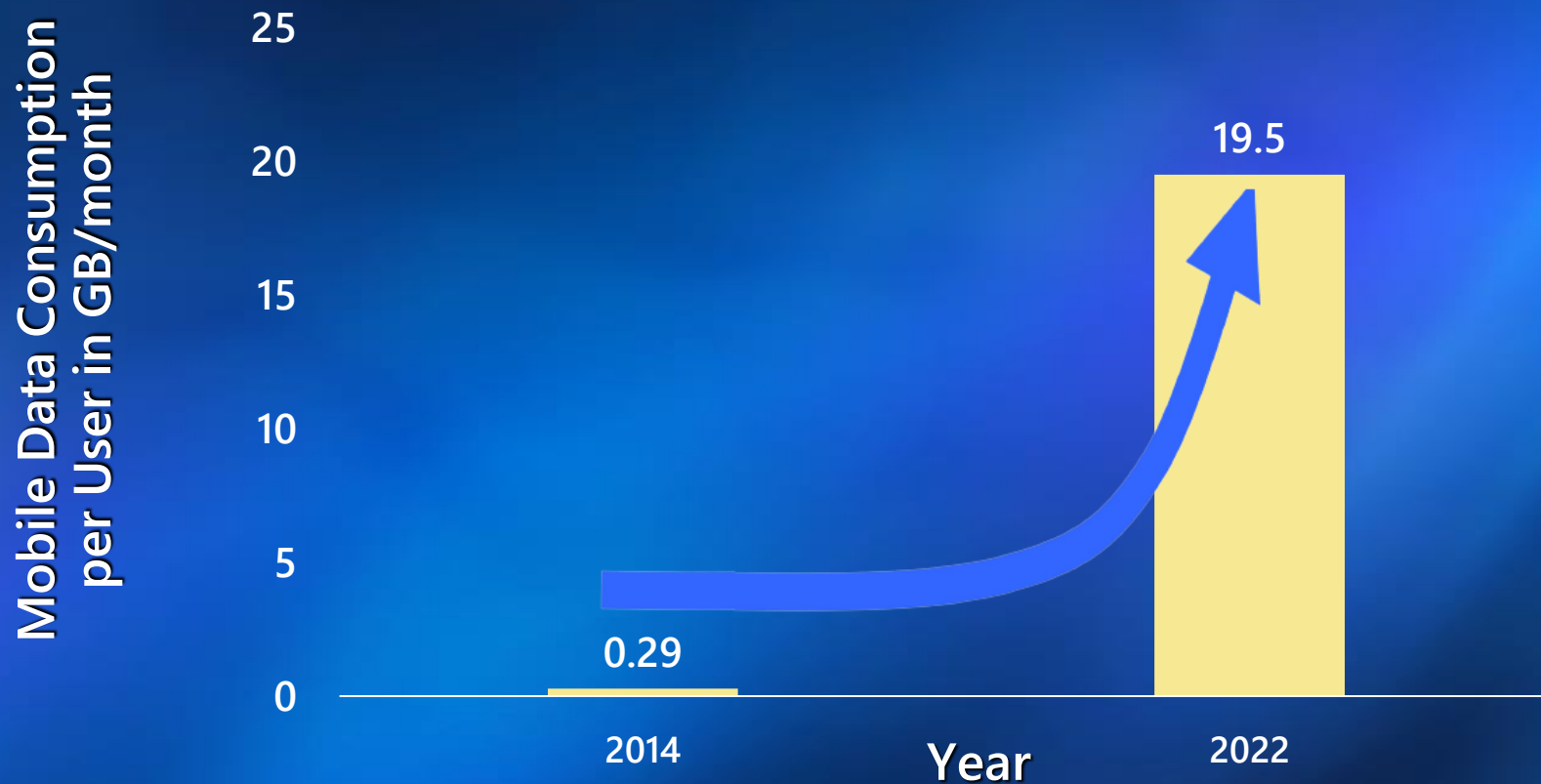
An Inspiring Case Study

Exponential Growth of Reliance

- First 15 Yrs – 1 Bn
- Next 15 Yrs – 10 Bn
- Next 5 Yrs – 100 Bn
- Next 3 Yrs – 250 Bn

True Lilies in the Pond Story!

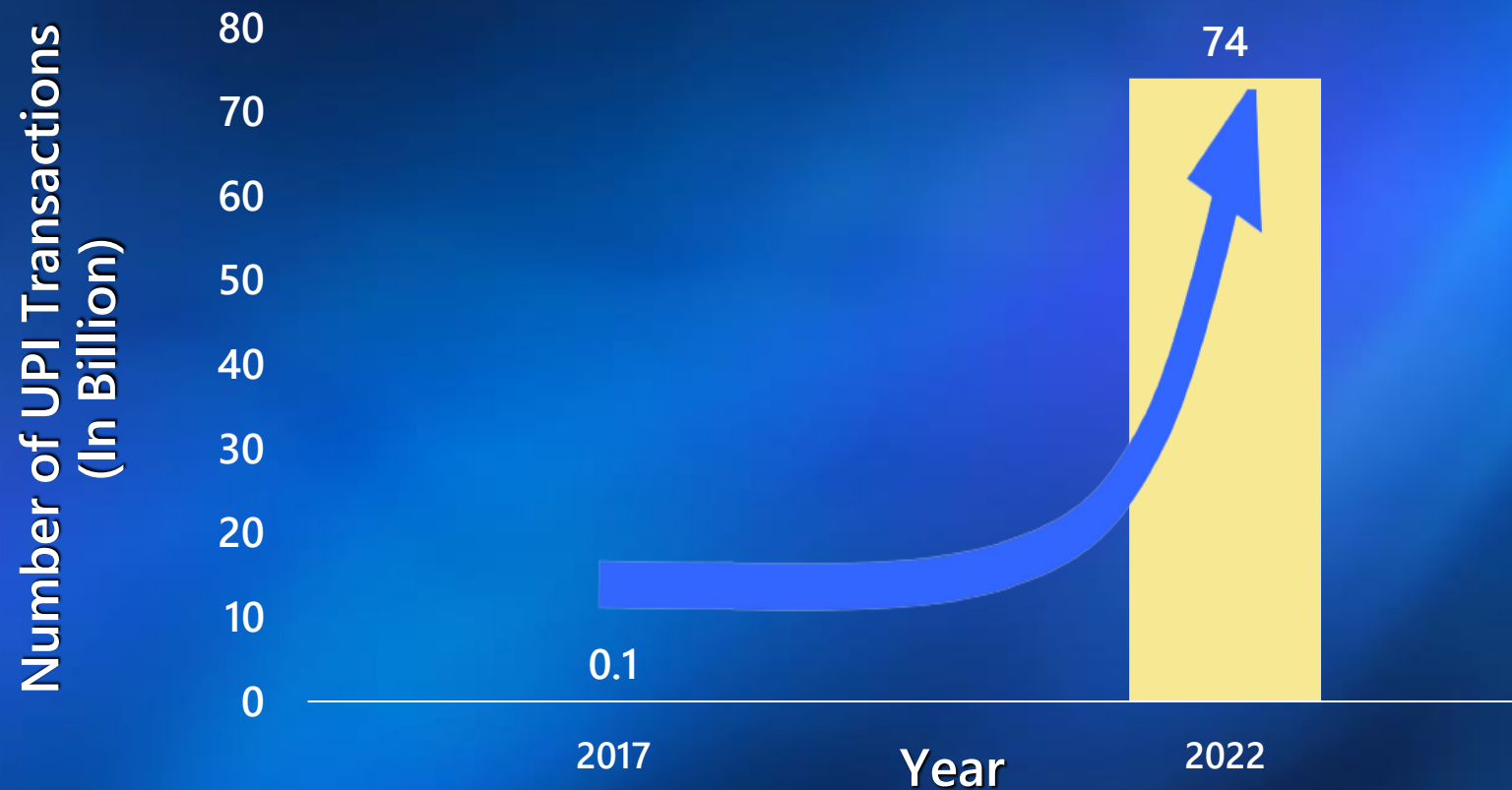
Exponential Growth in Mobile Data Consumption ~67 X in the last 8 years



Smartphone users in India grew ~ 4X in the last 8 years

Sources: <https://timesofindia.indiatimes.com/business/india-business/mobile-data-use-to-double-to-46gb/month-by-2027-study/articleshow/97996627.cms?>
<https://www.statista.com/statistics/467163/forecast-of-smartphone-users-in-india/>

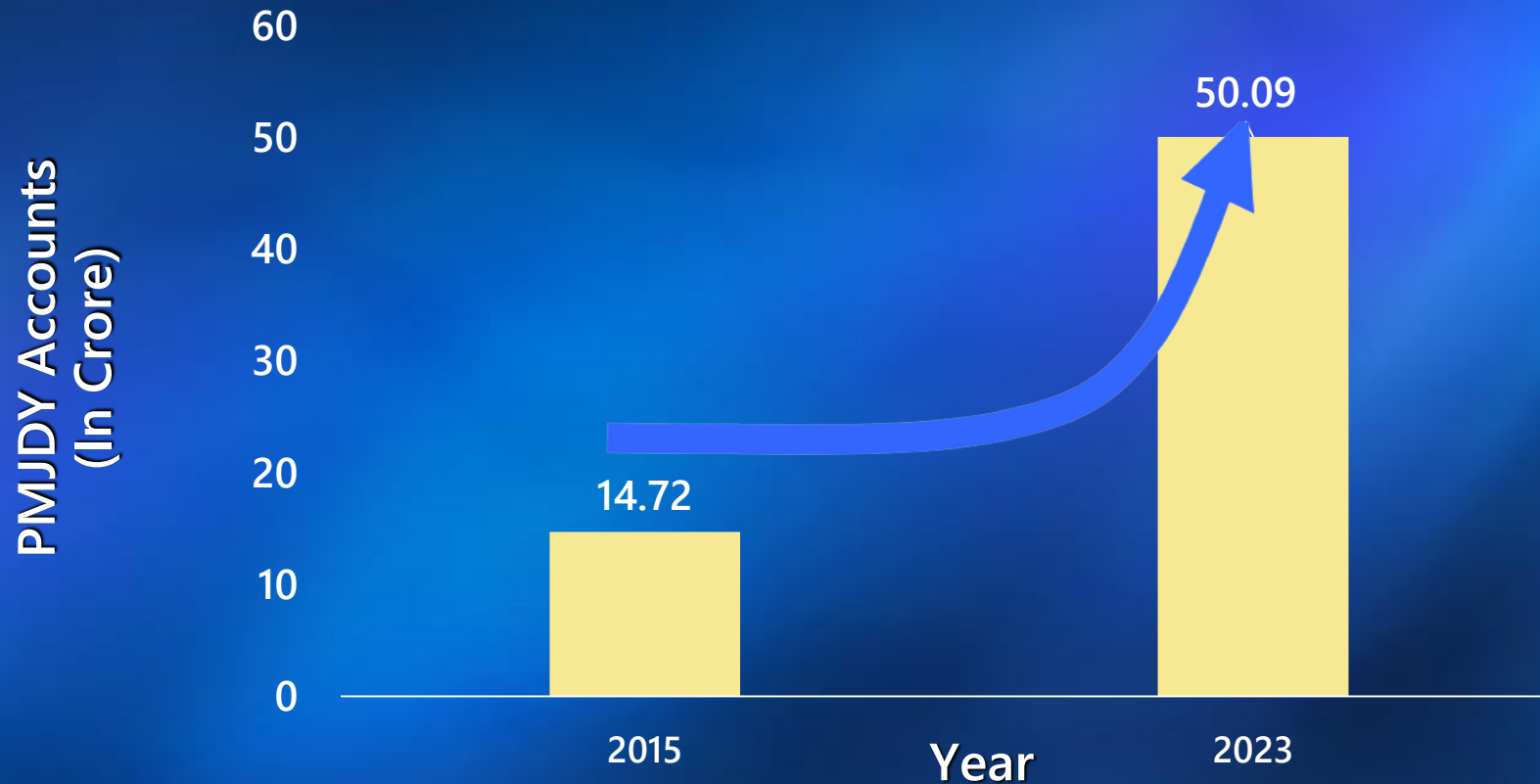
Exponential Growth of Real-time Transactions



In 2022, UPI clocked over 74.05 billion transactions i.e. 46% of the world's transactions.

Exponential Rise in PMJDY Accounts

World's Fastest & Largest Financial Inclusion



Indian Innovation Combinatorial (JAM)

Technology + Policy + System Delivery Innovation



CERTIFICATE

The most bank accounts opened in 1 week as a part of financial inclusion campaign is 18,096,130 and was achieved by Department of Financial Services, Government of India (India) from 23 to 29 August 2014

OFFICIALLY **AMAZING**



Jan Dhan Accounts



Aadhar Card



Mobile Phones

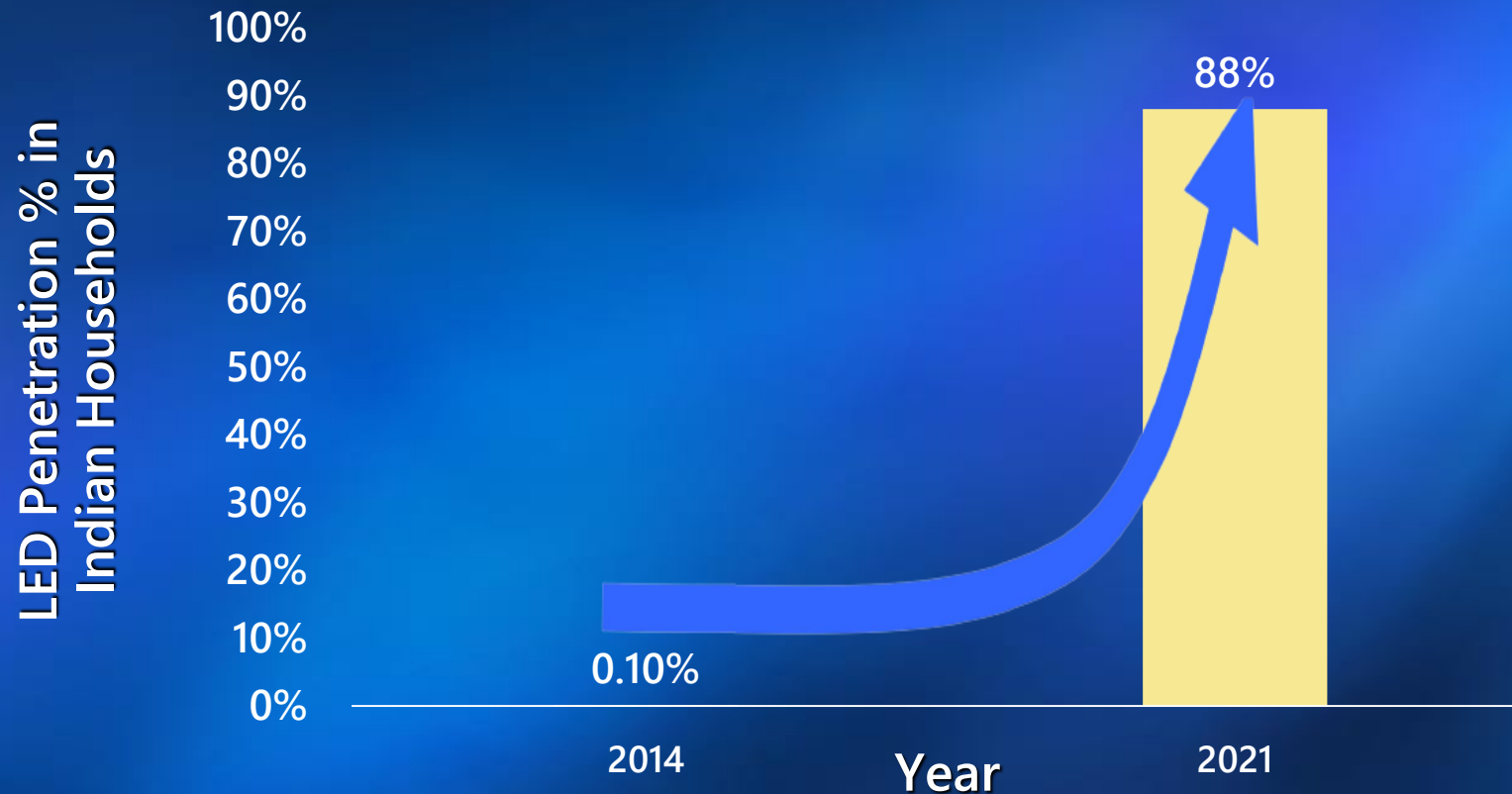
Bank Accounts held by Women 2014 (19%) to 2023 (56%)

PMJDY has brought the rural poor within the ambit of the banking system but issues like digital illiteracy, growing dormant accounts, and lack of debit cards continue to plague the financial inclusion programme



Exponential Growth in LED Penetration

From 0.1% To 88% in Just 7 years!



LED bulb prices in India dropped by 87% (310 ₹ in 2014 to ~ ₹ 38 in 2021)

India's LED Revolution – Exponential Inclusive Growth

LED lamp production up 30 times to 3 crore a month

Retail price of LED bulbs under govt's UJALA scheme drops to Rs 65 from Rs 550

Retail price of 9 watt LED bulbs under the government's UJALA programme has dropped to as low as Rs 65 per unit to encourage consumers to opt for these energy efficient lights.

Light Wave

In just over two years, a state-owned company has ushered in an LED revolution. It has brought down prices, disrupted the market and made the industry nervous. What's next?

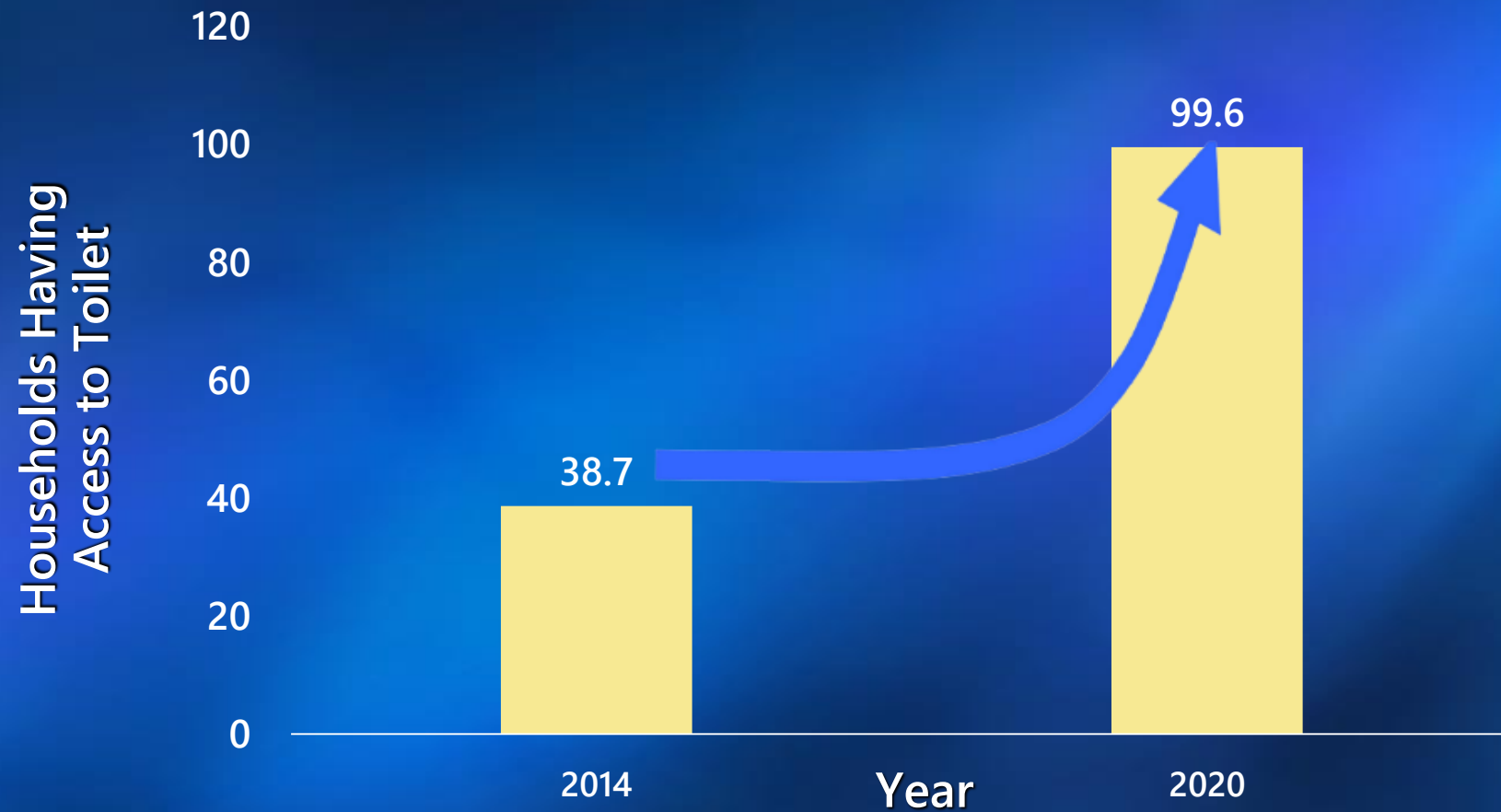
By Sumant Banerji | Print Edition: September 11, 2016

Rural areas to get 600 million LED bulbs at ₹10 apiece without govt subsidy

3 min read . Updated: 09 Aug 2020, 05:13 PM IST

Swachh Bharat 1.0 Mission – World's Largest Sanitation Initiative

Supported construction of ~10.9 crore individual household toilets



Anjani Mashelkar Inclusive Innovation Award (2019)



GenRobotics for Bandicoot

The Grim Reality Today

MANHOLES

THE DEATH PIT

At least **4.5 M** people are engaging in manual scavenging as their livelihood.

(Source: Unofficial survey by Sulabh International Social Service Organisation)

At least **22,327** men die in India doing various kinds of sanitation work.

(Source: The Indian express)

Approximately **98%** men and women are diagnosed with fatal diseases.

(Source: Indian Journal of Occupational and Environmental

One manual scavenging death every five days: Official data

Data obtained by The Indian Express shows that only 109 of the 170 districts have filed their response, and only 62 have identified at least one manual scavenger.



Panel counted 123 deaths since January 1, 2017. (File Photo)

Man in the Hole to Robot in the Hole



Simple User Interface



NO MANUAL ENTRY



MS ACT 13



TRAINING ASSISTANCE



GAS SENSING



MACHINE VISION



WATER RESISTANCE

Access to Dignity

GENROBOTICS

Before



www.genrobotics.org

After



info@genrobotics.org



3300+ sanitation workers already trained as robot operators

The Prohibition of Employment as Manual Scavengers and their Rehabilitation (Amendment) Bill, 2020

- Govt. introduced bill to make law banning manual scavenging more stringent
- The Bill proposes to completely mechanise sewer cleaning

National Action for Mechanised Sanitation Ecosystem

A National Action Plan was devised with the following Goals. The Goals may be classified as under:-

4.1 Modernisation:

- Modernization of existing sewage system and coverage of non sewerred areas;
- Setting up of faecal sludge and septage management system for **mechanized cleaning** of septic tanks, transportation and treatment of faecal sludge;
- Equipping the municipalities, Panchayats and Private Sanitation agencies with appropriate technology and machinery for **mechanized cleaning**;
- Setting up of Sanitation Response Units with help lines

4.2 Prevention:

- Eliminating human entry in sewer systems and septic tanks
- Amendment of Prohibition of Employment as Manual Scavengers** and their Rehabilitation Act, 2013 and Prohibition of Employment as Manual Scavengers and their Rehabilitation Rules, 2013;

4.3 Rehabilitation:

- Rehabilitating persons previously engaged in **manual cleaning**.
- Training and certification of sanitation professionals;

5 Strategies for achieving the goals:

- 5.1 Modernisation of existing sewage systems and coverage of non-sewerred areas:** Efforts to be made to modernise the existing sewage systems so that they are not prone to blockages and more suitable for mechanised cleaning. Further, wherever feasible, the areas serviced by septic tanks need to be covered by sewer lines, in a phased manner.
- 5.2 Tackling non-sewerred areas:** In such areas which continue to be non-sewerred and are dependent on septic tanks and/or open drains, 'Faecal Sludge and Septage Management Systems' be set up for mechanised cleaning of septic tanks and collection, transportation and treatment of the faecal sludge.
- 5.3 Equipping the Municipalities/Local Bodies:** Each local body/Municipality, and private sanitation agencies, if any, to equipped with appropriate technology, machinery, etc. (**mechanised solution**) and ensure that only trained professionals are allowed to enter the sewer/septic tanks.

Swatcha Bharat 2.0 Awards Ceremony 20 November 2023 Morning



- Chairman of Standing Committee for Selection of Technology for Ministry of Drinking Water & Sanitation (2014-19)
- Chairman of FICCI-ISC Awards on Sanitation (2017-till date)



Startup Story – Exponential Growth with Inclusion

India Produced More Unicorn Startups In 2021 Than All Previous Years Put Together

- 476 startups (2016) exponentially rising to ~70,000 plus in 2021
- Till 2016, 1 unicorn per year. Rising to almost 1 unicorn per week!
- 44 unicorns with a total valuation of \$ 94.77 Bn were born in 2021
- Almost 50% of unicorns come from Tier III and Tier II cities
- Exponential Inclusive Growth!

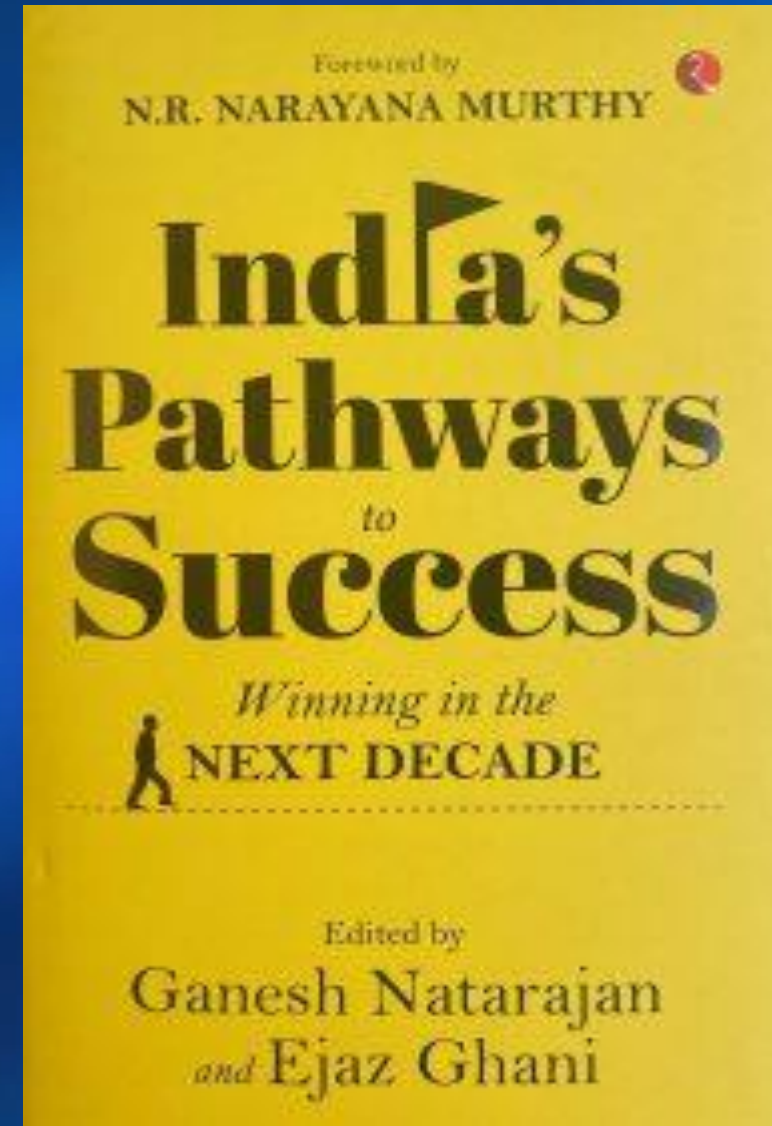
Indian Startup Ecosystem has seen exponential growth in past few years (2015-2021):

- 9X increase in the number of investors.
- 7X increase in the total funding of startups.
- 7X increase in the number of incubators

Bharat@100 – Strategies For The Future



<https://puneinternationalcentre.org/2023/01/21/rising-to-the-china-challenge/>



<https://puneinternationalcentre.org/2023/02/01/indias-pathways-to-success/>

Prediction comes true -21 Years Down the Line!

1995

LALA KARAM CHAND THAPAR CENTENARY
MEMORIAL LECTURE
(Instituted by Patiala Technical Education Trust)

INDIA'S EMERGENCE AS A GLOBAL R & D PLATFORM: THE NEW CHALLENGES AND OPPORTUNITIES

Dr. R.A. Mashelkar
Director
National Chemical Laboratory, Pune

4 March 1995

THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY
(DEEMED UNIVERSITY)
PATIALA - 147 001

2016

Emergence of India as a global R&D hub

In March 1995, Dr RA Mashelkar delivered the Lala Karam Chand Thapar Centenary Memorial Lecture¹, which was presided over by Dr. Manmohan Singh, the then Finance Minister. While delivering this lecture, titled 'India's emergence as a global R&D platform: Challenges and opportunities', he had said: "I have a strong belief that the vision of India as a global R&D platform would materialise and it would materialise sooner than we expect provided we move swiftly and with determination." Hardly anyone in the audience believed that this could happen.

Raghunath Mashelkar
President, Global Research Alliance

Aravind Chinchure
Chair Professor of Innovation and
Entrepreneurship, Symbiosis International
University

R&D Centres in India established by 928 multinational companies (MNCs) with a total workforce of 323,000 scientists and engineers.

So the dream of India becoming a global R&D platform, which was articulated by Dr. Mashelkar twenty-one years ago has indeed come true!

EARLY STEPS: SOME PERSONAL REFLECTIONS

Forward two decades—in June 2016, media carried the news 'Bengaluru Fifth Most Preferred Destination by MNCs for Technology and Innovation Centres.' This was based on a study by Capgemini, which reported that Bengaluru has now displaced Tokyo from the fifth spot on the list of most preferred destinations for innovation centres for global multinational companies.

Another headline read: 'India top destination for R&D investment; beats US, China.' A study conducted by US-based HBS Research reported that India leads with 50% of the new global R&D centre announcements. As per this study, from April to December 2015, out of the 190 new R&D centre announcements, 97 of them chose India as a destination.

Where does India stand today? According to 'Zinnov report', by the end of 2015, there were 1,165

Let us look at the early beginnings of the evolution of India's emergence of global R&D hub from the lens of Dr. Mashelkar, when he was the Director of National Chemical Laboratory (NCL) during 1989-99.

In his opening address to the NCL staff on June 1, 1990, he had said that National Chemical Laboratory should transform itself into an 'international chemical laboratory' by licensing its technology even to the leading multinational companies, and not limit itself to Indian companies. This looked like an audacious dream for a laboratory, which, from its inception in 1950, did not have a single US patent in its credit. Soon, under an efficient leadership the culture of NCL changed from 'public or petal' to 'patent, publish and prosper'. The results soon followed. NCL entered the global R&D market in 1990, even before the advent of the new industrial policy that was announced in

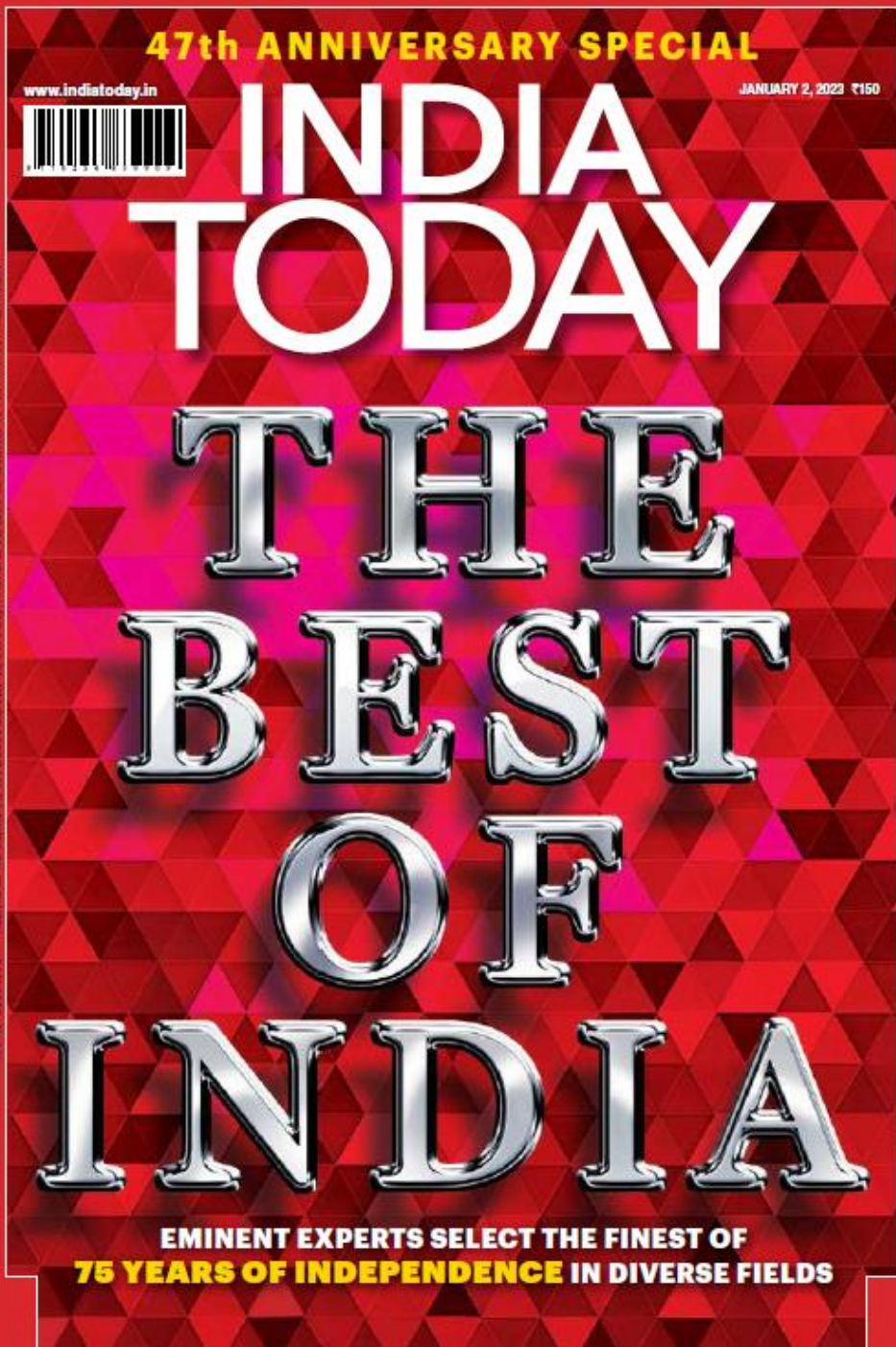
AUGUST-SEPTEMBER 2016
www.ibat.org

India has the Highest R&D Publications Productivity per unit Dollar Spending among Leading Economies

| Country | GDP per capita (current US\$), 2020 | GDP (current US\$ Trillions), 2020 | R&D Expenditure (% of GDP)* | R&D Spending (US\$ Billions) in 2020 | Publications Count, 2020 | Publications Count per US\$ <u>Billion</u> R&D Spending | Ratio of R&D US \$ spent per R & D US\$ Spent in India for same output (Round Numbers) |
|-----------|-------------------------------------|------------------------------------|-----------------------------|--------------------------------------|--------------------------|---|--|
| India | 1,928 | 2.66 | 0.65% | 17 | 1,67,157 | 9668 | 1 |
| UK | 41,125 | 2.76 | 1.70% | 47 | 2,15,054 | 4583 | 2 |
| Australia | 51680 | 1.33 | 1.83 | 24 | 53,610 | 2203 | 4 |
| China | 10,435 | 14.72 | 2.14% | 315 | 6,37,688 | 2024 | 5 |
| Germany | 46,208 | 3.85 | 3.13% | 121 | 1,90,010 | 1577 | 6 |
| USA | 63,414 | 20.89 | 2.83% | 591 | 8,07,027 | 1365 | 7 |
| Japan | 40,193 | 5.06 | 3.28% | 166 | 1,31,706 | 794 | 12 |

*Latest data for R&D Expenditure (% of GDP) was available for 2018

Source: World Bank, UNESCO and OECD



The Best of India@75 Story

47
TH
ANNIVERSARY



SCIENCE AND
INNOVATION

By RAGHUNATH
MASHELKAR

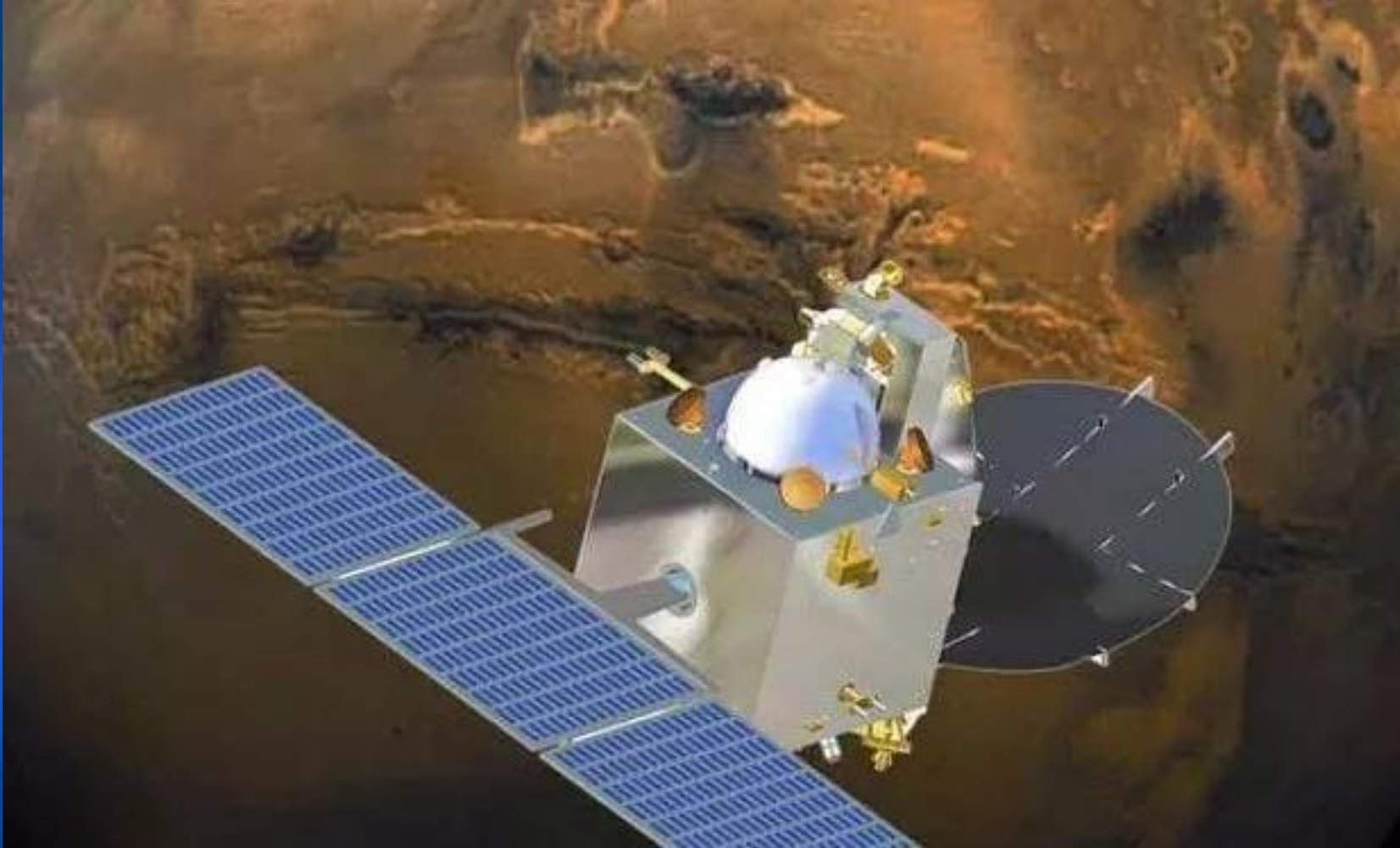
Scientist, innovator
and technocrat



Proof of Eminence

Indian scientists and innovators have had numerous achievements in the past 75 years that have made us all proud. If the Green and White Revolutions ensured food security for the nation, its nuclear, space and defence research has placed India among the global leaders. Here, we select the key milestones that have been game-changers for India

Mars Orbiter Mission - India the Only Nation to Reach Mars in its First Attempt



Mangalyaan was 10X cheaper than USA in achieving the same mission

From Bicycle to A Billion Dreams

On 21 November 1963, India launched 1st Rocket



on 23 August 2023, India became the first nation to land on Lunar South



ISRO Launched 104 Satellites on A Single Rocket



- 2nd highest number of satellites ever launched in a single mission by any other country in the world.
- Of the 104, 101 were foreign satellites to serve international customers.

Indian Science & Innovation helped India cross 2 Billion COVID-19 jabs in 18 months

India took only 278 days to reach 1 billion mark and 269 days to reach another billion



3.6+ Million
doses per
day



Article

Exponential Technology, Industry 4.0 and Future of Jobs in India

R. A. Mashelkar¹

Review of Market Integration

10(2) 1–20

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Development Foundation

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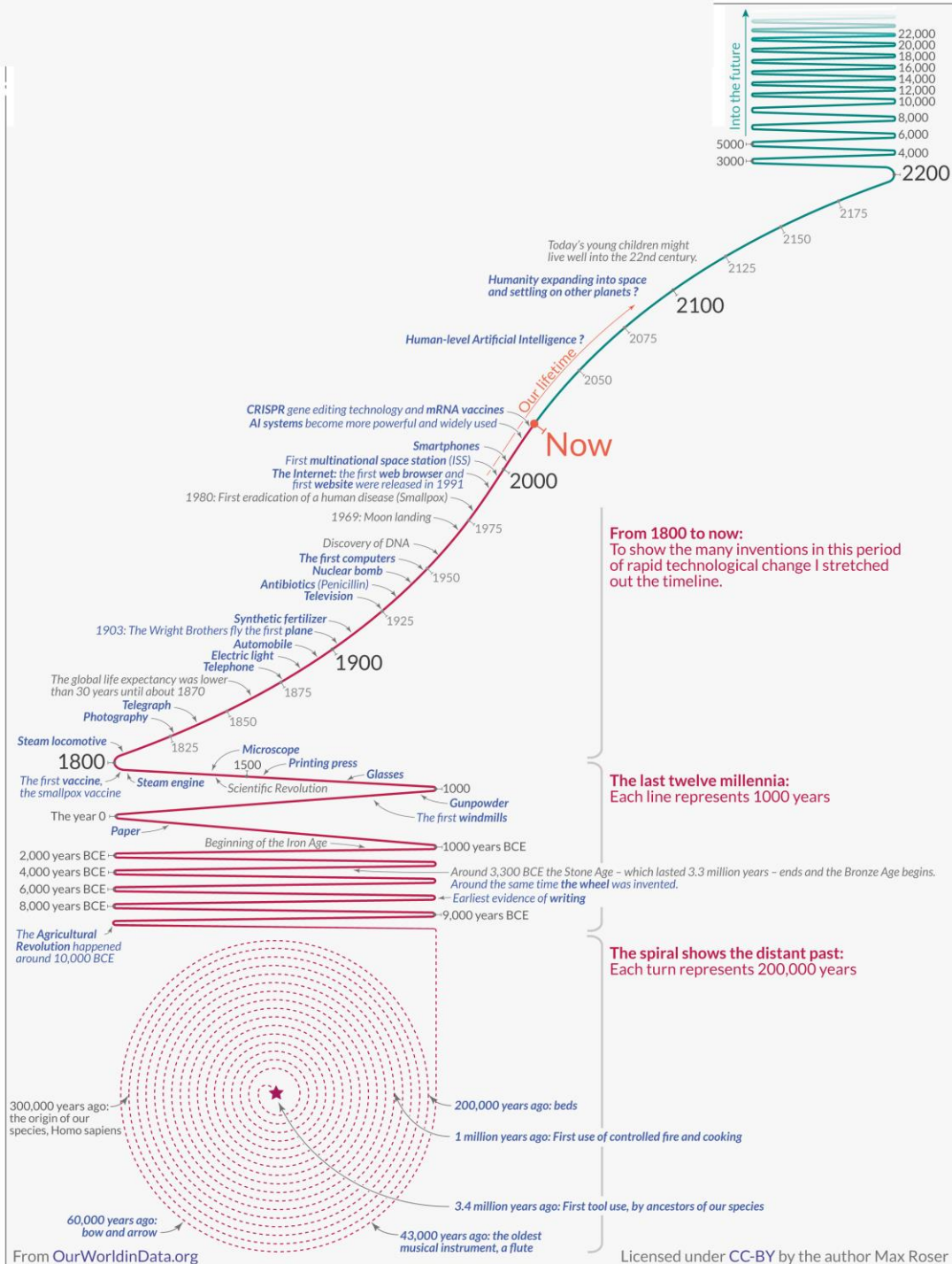
<http://journals.sagepub.com/home/rmi>



What would be the technological landscape for Bharat@100?

No one can tell!

- Our ancestors took 2.4 million years to control fire and use it for cooking.
- Moderna's vaccine was developed, tested, and deployed in <1 year, a record time.
- ChatGPT has become the fastest-growing consumer application in history reaching 100 million users in just 2 months.
- AI is expected to reach the level of human intelligence in a decade.
- Technology will continue to change the world – we must make sure that it helps us build Atmanirbhar Bharat@100 with Atmavishwas



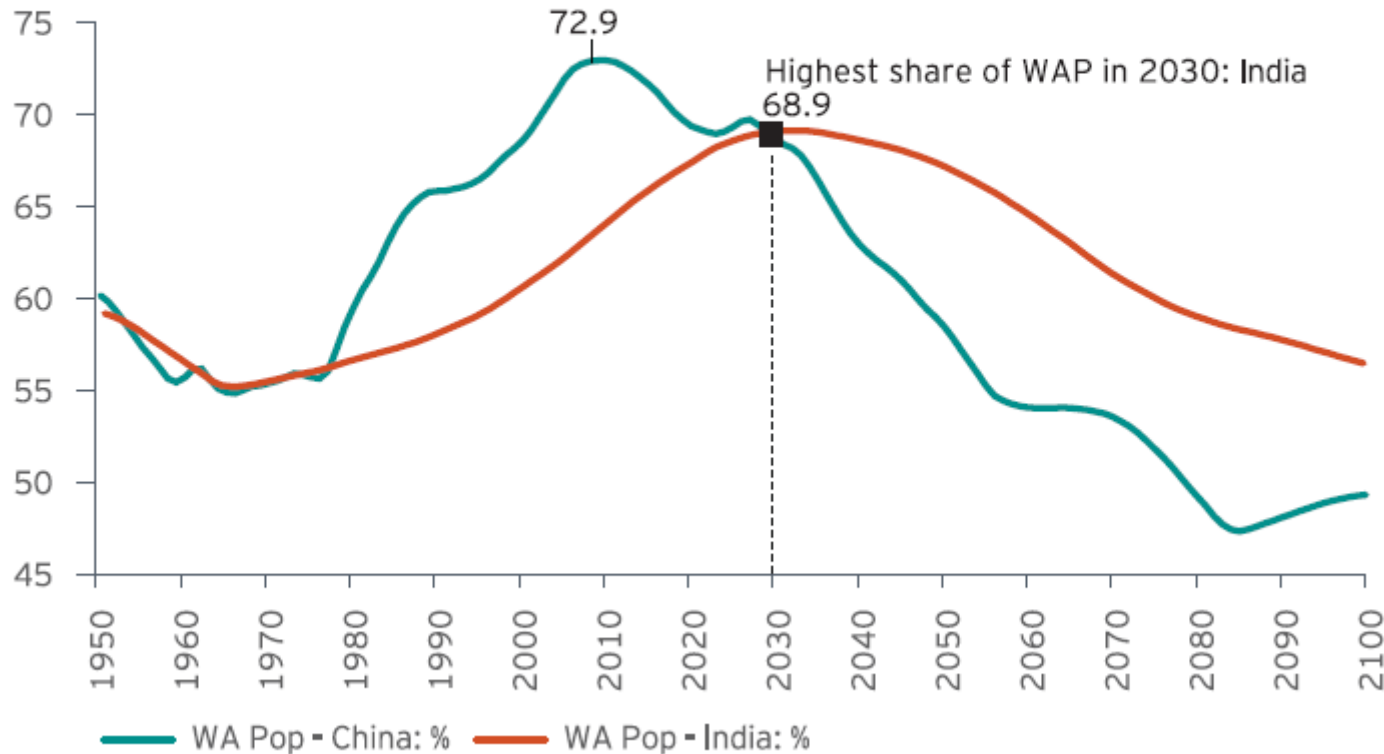
Some Fundamentals for Building Bharat@100

- Expansion, Inclusion & Excellence
- Speed, Scale, Sustainability
- Digitalisation, Decentralisation, Decarbonisation
- Talent, Technology, Trust
- Inspiration, Inspiration, Inspiration

Advantage India: Demography, Diversity, Democracy

A worker boom

India's working age population to total population ratio will be the highest of any large economy



Source (basic data): UN Population statistics 2022; WAP stands for working age population

India Demographic Advantage

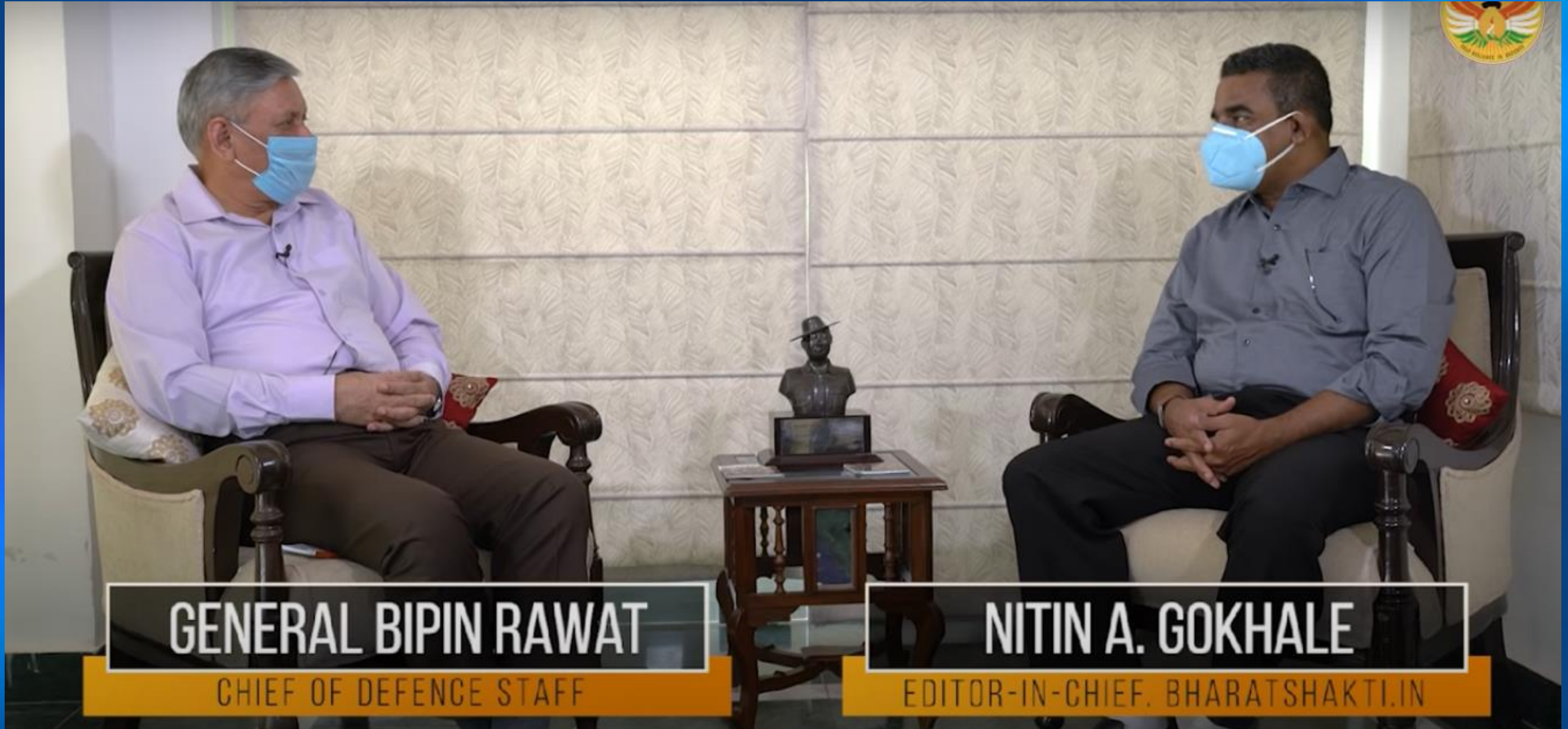
- Relatively young population with a median age of 28.4 years
- 1.04 Billion working-age persons by 2030
- ~ 24.3% of the incremental global workforce over the next decade will come from India

India's Ranking on Various Development Indicators

| Index | 2017 Ranking | 2022 Ranking | Last 5 Years Trend |
|---|--------------|--------------|--------------------|
| World Bank's Ease Of Doing Business | 100/190 | 63/190 | ↑ |
| IMD Global Competitiveness Index | 45/63 | 40/64 | ↑ |
| WIPO Global Innovation Index | 60/127 | 40/132 | ↑ |
| UN Human Development Index (HDI) | 130 /189 | 132 /191 | ↓ |
| World Happiness Index | 122/155 | 124/146 | ↓ |
| Transparency International's Corruption Perceptions Index (CPI) | 81/180 | 85/180 | ↓ |
| Global Hunger Index | 100/119 | 107/121 | ↓ |

Sources: <https://www.undp.org/india/press-releases/india-ranks-132-human-development-index-global-development-stalls>;
<https://economictimes.indiatimes.com/news/economy/indicators/india-ranks-130-in-uns-human-development-index/articleshow/65812719.cms>
<https://archive.doingbusiness.org/en/rankings?region=south-asia>
<https://www.moneycontrol.com/news/business/2023-global-competitiveness-index-india-at-40-ireland-leaps-to-2-singapore-slides-to-4-10856591.html>
<https://economictimes.indiatimes.com/news/new-updates/india-ranks-126th-in-world-happiness-index-2023-amidst-rising-mental-health-concerns/articleshow/103727303.cms>
<https://www.transparency.org/en/countries/india>

Time has come to move From "Leapfrogging to Pole Vaulting" - Late General Bipin Rawat



GENERAL BIPIN RAWAT

CHIEF OF DEFENCE STAFF

NITIN A. GOKHALE

EDITOR-IN-CHIEF, BHARATSHAKTI.IN

Vision for Bharat@100

1. संतुलित (Balanced)

Classless inclusive liberal society, Balances economics, environment & equity
2. सुसंस्कृत (Cultured)

Preserves, protects & proudly promotes our rich culture, values, and heritage
3. सुविद्य (Educated)

Has a holistic value based system that blends education & enlightenment
4. समृद्ध (Rich)

\$40 trillion economy, avoiding middle income trap
5. सुशासित (Well Governed)

Good governance, with consensus, rule of law, transparency, accountability
6. सुरक्षित (Secured)

Secures both external & internal dimensions such as food, health, energy...
7. स्वानंदी (Happy)

Happy India with 1.4 Billion happy faces & not just a privileged few

Bharat@100 will be built by Bharatiya@100

FIVE MASHELKAR MANTRAS

1. Aspirations are your possibilities. Keep them high, but for you as also for our society, our beloved nation.
2. You can do anything but not everything. So focus.
3. Purpose, perseverance & passion. Too early to quit. Winners are never quitters. Quitters are never winners. FAIL is 'first attempt in learning'.
4. When doors of opportunity, that you keep on knocking, don't open, create your own doors.
5. No limit to human endurance, achievement, imagination, excepting the ones you put on your mind. Every morning , whether you are 18 or 80, say 'my best is yet to come & today is going to be that day...

Thank You