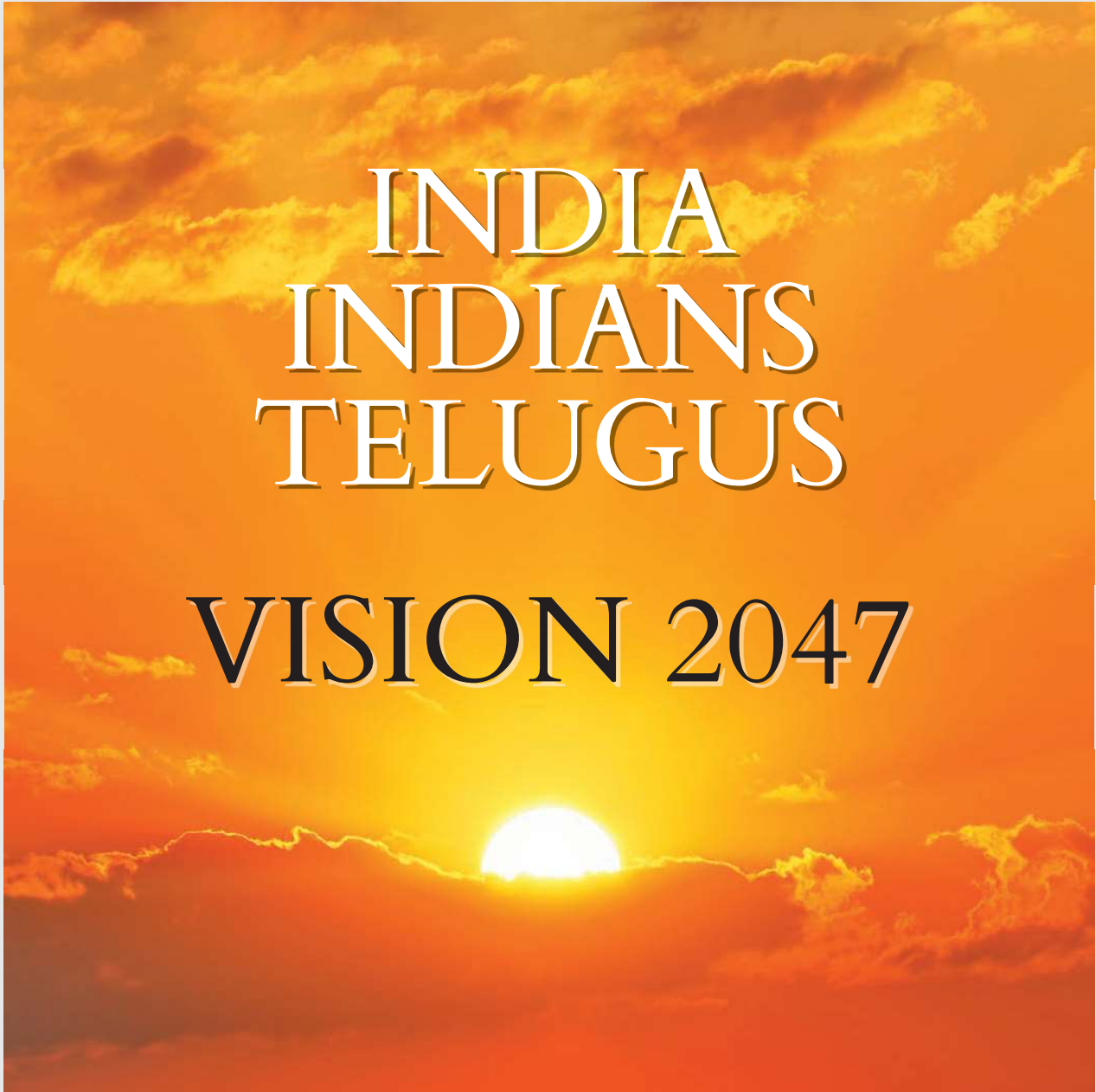


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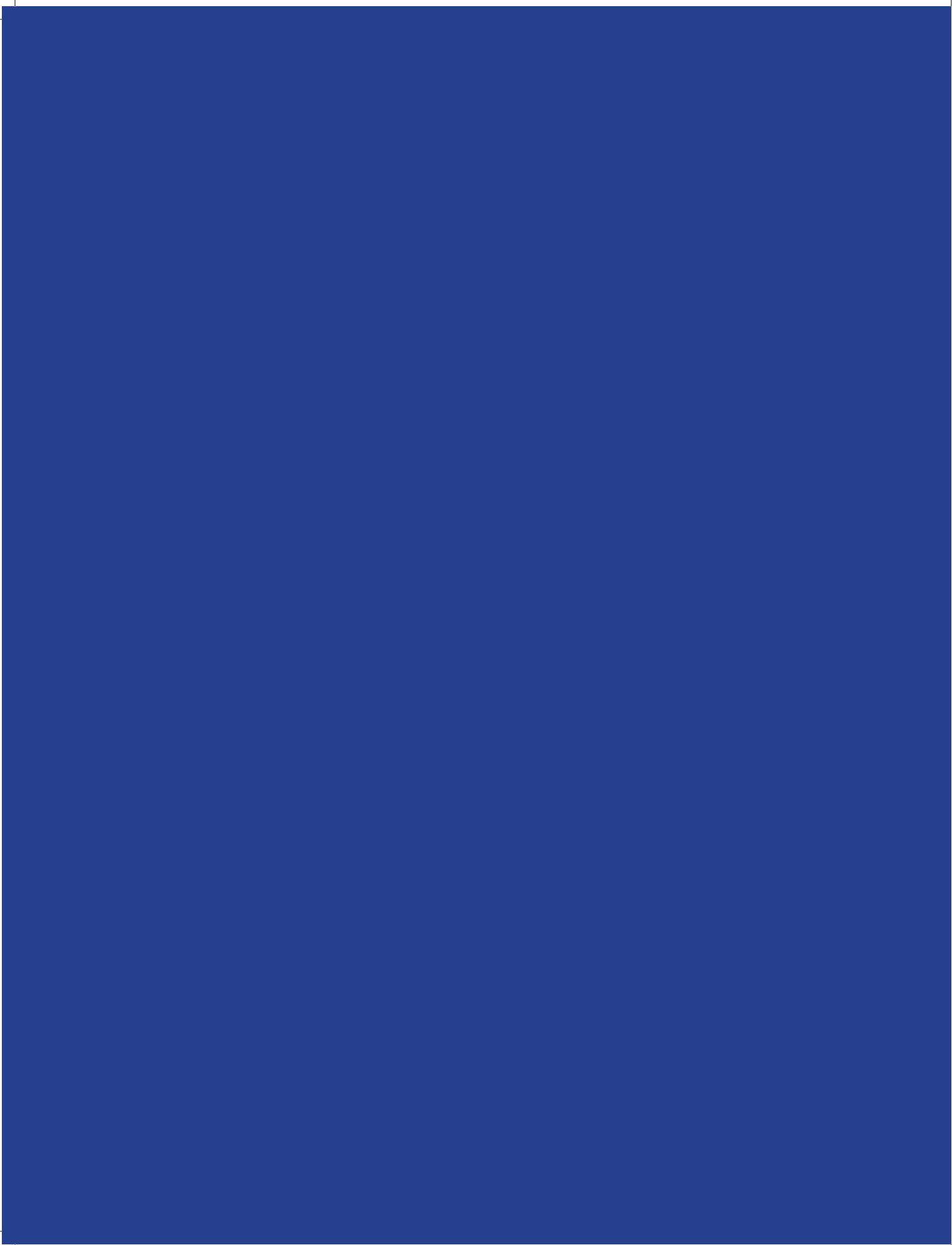


# INDIA INDIANS TELUGUS VISION 2047



GFST

Global Forum for Sustainable Transformation



# **FIVE STRATEGIES FOR INDIA AS A GLOBAL LEADER**



Global Forum for Sustainable Transformation

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Strategy



**RESEARCH,  
INNOVATION AND  
TECHNOLOGY –  
LEADING THE FUTURE**



## TECHNOLOGY - RESEARCH AND INNOVATION ECO SYSTEM for INNOVATION DRIVEN ECONOMY

### From Technology Transfer to Defining the Future – Invest in Knowledge Based Capital

The economy of the future will be driven by continuous investigation into new materials, processes, and products. The newly industrialized nations have relied on Deep Technology and knowledge-Based Capital (KBC) to fuel the transition of their economy from factor-driven to innovation-driven. The Deep Technologies are the disruptive technologies that completely redefines the products are not just incremental improvements. KBC<sup>5</sup> comprises of three classes: computerized information (software and databases), innovative property (patents, copyrights, designs, trademark), and economic competitiveness (including brand equity, firm specific human capital, networks of people and institutions, and organizational knowhow that increases enterprise efficiency). Business investment in KBC in many OECD countries is exceeding the investment in physical capital which improves productivity. Such investments in USA and some EU countries have contributed 20 to 34% labour productivity growth. An analogous imperative for India would afford it the advantage of capitalizing on the potential to rapidly advance in new technological domains that will be at the core of future economic growth, therefore establishing itself as an economy driven by innovation. The country will incur significant opportunity costs by neglecting investment in the research, development, and innovation system. By allocating resources towards research and development, India can enhance its capacity to export technology rather than relying on technology transfer.

### A financially supported and shared vision driven by government, industry and academia

In order for India to establish itself as a knowledge hub, it is imperative to prioritize the development of ecosystems that nurture knowledge production through the utilization of these technologies. Simultaneously, these ecosystems should also support and facilitate the growth of trade centered around these technologies. Current literature on national and regional innovation systems defines that interaction of several agencies and factors between government, industry and academia would shape the innovation ecosystem. Thereby, a systemic drive converging the efforts of all the stakeholders would be the only way forward for developing an ecosystem around these technologies. A well-researched and thought-out agenda for research in technologies, materials and

processes for next say twenty years shall be worked out by these three players. This agenda shall be supported by adequate financial resources to establish research facilities, Centers of Excellence around the selected technologies to run these facilities. The approach adopted for promotion of innovation and emerging technologies in the country is based on the twin pillars of developing technological creating capability and technological diffusion capability.

### Development of Technology Diffusion Capacity

Technological diffusion is the process by which innovations such as new products, new processes or new management methods spread within and across economies. The process of technological diffusion leads to the realization of benefits from technological advancements i.e., innovation and R&D. Technological Diffusion Capability involves components that enable firms in accumulation, assimilation and adoption of technologies. This requires developing capability in firm for selection, application, and development of the technologies. The key components include availability of technological infrastructure, governance and policy interventions, human resources, investments etc. The facilitation of technology diffusion within an economy can be expedited by the government through the strategic selection and endorsement of innovations, as well as the establishment of robust technical infrastructure and supportive.

### Development of Technology Creating Capability

This involves capacity to create new technologies based on research and development, intellectual property rights and is focused on creating first-mover advantages in the market. It depends upon developing scientific research and intellectual property by providing support through research labs, centers of excellence, effective intellectual property rights protection, scientific training and courses, promotion of research at universities, linking research with industry, availability of funds for research, collaboration and knowledge sharing among research institutions etc. Focus shall also shift from publication to patents to create value for the respective stakeholder.

### Competition and Innovation Promoting Ecosystem

Indian economy is transitioning from factor driven phase to efficiency driven phase and in parallel is engaged in innovation driven sectors of economy. For sustaining the efficiency, India needs to invest in physical capital whereas to be a leader of innovation driven economy, India needs to step up its investment in KBC and physical capital R&D. A shared vision, as mentioned above, will outline the contours and roles various stakeholders have to play. Going forward, a framework consisting creation of physical infrastructure, human capital, policy regime, taxation, cross

5. OECD (2013), Supporting investment in Knowledge Capital, Growth and Innovation

border enterprise, would be required to create competition and innovation ecosystem. Some of the areas, that require attention in India are listed below

- Intellectual property right regime should keep pace to cover innovation in new areas particularly in digital technology.
- Faster patent turnaround time to reduce innovation deficit
- Financial and investment rules that promotes early-stage investment in KBC and less stringent bankruptcy laws in case of failures in KBC
- A tax regime that incentivises the investment in research and development. The innovative products with export potential can be considered for lower taxation rates to promote investment in KBC.
- A Competition Policy should be framed in consultation with multiple stakeholders and learning from many countries who have moved ahead in research and development.
- Research Centers for Technologies of Future - Specialised centres for research in to deep technologies of future including KBC shall be established by both government and private companies independently or in collaboration. Although it would be hazardous to list the disruptive technologies of future, some of the promising technologies or the ones nearing maturity for commercial applications and would require dedicated research will include:
  - Bio-Science – vaccines, personalised and genome mapped drug discovery.
  - Transport – new fuels, green hydrogen, autonomous vehicles, green vehicles, batteries
  - Information Technology – cyber security, AI, quantum computing, metaverse, blockchain, Fintech, AR, VR
  - Materials and nanotech
  - Sensors, IoT, drones
  - Industrial robotics, precision manufacturing
  - Additive and 3-D printing.

## Nurturing Innovation and Future Job Providers – START UPS

World Economic Forum<sup>6</sup> estimated that 70% of new value created in the economy globally over the next ten years will come from digitally enabled platform business models. These start-up hubs will be critical value drivers for Asia as well as the global economy. As per Ease of Doing Business

rankings 2020 by World Bank<sup>7</sup>, three Asian ecosystems have been ranked among the top places to do business globally - Singapore ranking second in the list, Hong Kong ranking third, and the Republic of Korea securing the fourth position. Beijing, Shanghai, Seoul, Tokyo, Singapore, Shenzhen, Bangalore, Delhi, and Mumbai have been among the top performing startup ecosystems in Asia and globally<sup>8</sup>.

### Evolving Asian Start Up System and India Rising

The Asian landscape is changing very rapidly, and Indian Startup Ecosystem is seeing rapid growth. FY 2021-22 has been a pivotal year for Indian Startups Ecosystem with total VC funding reaching \$38.5 billion; investments growing at 3.8x over 2020 as compared to 1.3x for China. India has minted 44 unicorns in 2021 with exits rising to \$14 billion, leading to a 10x increase over 2020. India witnessed 22 unicorns in 2022. Bangalore, Delhi, and Mumbai have been ranked among the top startup ecosystems globally with Hyderabad, Telangana, and Kerala catching up fast as one of the fastest growing startup ecosystems as per a report by Startup Genome and Global Entrepreneurship Network<sup>9</sup>. Enabling Policy and Institutional Framework for Start Ups in India

The government of India has launched various initiatives and programs to accelerate the Startup ecosystem in India such as Startup India Seed Fund Scheme, Standup India, MAARG Platform, etc. The Government of India has also kicked off various initiatives in partnership with Corporates, State Governments, and educational institutions to promote collaboration and provide support to startups. Institutional and policy support has been a significant contributor to sustaining the growth of the Startup ecosystem in India.

State Governments are also leading the way in stimulating the regional startup ecosystem. T-Hub by the Government of Telangana is a pioneering collaborative model of innovation and entrepreneurship by bringing key stakeholders in the Startup Ecosystem together - government, corporates, academia, investors, and mentors. In addition to this, the plug-and-play model and infrastructure at T-Hub eases out the initial pre-seed to seed stage journey for an entrepreneur. Startup Karnataka, Start in UP, Kerala Startup Mission are other successful examples of government, corporate, and academia collaboration to stimulate the regional startup ecosystems.

There are various successful examples of successful initiatives by Governments across Asia for promoting collaboration among startups, academia, and corporate, enabling growth capital, and provisioning plug-and-play infrastructure models to handhold startups on their growth

6. Shaping the Future of Digital Economy and New Value Creation, World Economic Forum (<https://www.weforum.org/platforms/shaping-the-future-of-digital-economy-and-new-value-creation>)

7. Doing Business Comparing Business Regulation in 190 Economies 2020 by World Bank | 8. The Global Startup Ecosystem Report 2022

9. Startup Genome Report 2023, Bain Venture Capital Report 2021 & 2022



journey. Enterprise Singapore, SGInnovate, NUS Enterprise are one of the most successful startup initiatives in Asia and globally working towards enabling infrastructure, growth capital, and R&D support for startups. Kyoto Startup Ecosystem Promotion Council, Plug and Play Kyoto, Dedicated Startup City in Kei Hanshin region are among the many initiatives by the Government of Japan to enable 360° support to startups

However, as the technology and business landscape is rapidly changing, the policy and institutional framework and educational system in India would also need to evolve to keep up pace with this dynamic landscape and drive sustainable growth

### **Building the Funnel of Innovators and Startups for the Future**

The startups in India have been primarily focused on building solutions for driving efficiencies and connecting users such as B2B and consumer SaaS, eCommerce, Fintech, Digital Media, Aggregator platforms, etc. This phase of growth has come from driving efficiencies and building platforms that connect users, however, the next phase of growth will be driven by research and development and building intellectual capital. To capture this next phase of growth, the Indian economy will require heavy investments in research and development in both public and private R&D institutes, corporates, and educational institutions. Collaboration with corporates will be a critical driver for accelerating research, product development, and building intellectual capital. Corporates can provide access to knowledge base and APIs to startups and researchers, R&D infrastructure, launch joint research projects, etc. This will help corporates drive innovation, invest in potential technologies in early stage, and provide ample resources to startups and researchers to innovate and build intellectual capital. This will provide vitality to the next generation of companies and innovators who are testing and releasing solutions in developing technology. This will also be critical for Indian Startups to build a competitive edge over their global counterparts in product innovation and building the value proposition.

### **Establishing Global Linkages and Global Brands from India**

India has a large community of non-resident Indians across the globe working in tech, research, academia, venture capital, and more, who are keen to contribute to the startup community in India. Establishing linkages with this global community of non-resident Indians across geographies and industries would enable knowledge transfer and

networking opportunities for Indian Entrepreneurs. These linkages will help in building a vision among Indian Entrepreneurs to go global at an early stage; enabling them with the knowledge and exposure to global markets. These global communities of mentors and startups would be a significant contributor to the next phase of growth of Indian Startups.

An abundance of elite MBAs with experience venturing into global markets already occupy the ranks of Indian and multinational corporations. This enables a strong GTM machinery available locally which can drive commercialization of these technologies and execute global go-to-market strategy sitting from India. Additionally, the local MSME and manufacturing ecosystem will play a crucial role in the fast and cost-effective commercialization of technologies in fields like space tech, advanced manufacturing, robotics, etc. Investments and institutional support for productivity enhancements and digitization of MSMEs will lay a base for Indian Startups for building an edge over their global counterparts.

### **Driving Hyper Growth through Emerging Start Up Hubs**

The government of India has launched various initiatives to develop Incubator and Accelerator networks pan India. Even yet, expanding the accelerator network in India has an enormous amount of untapped potential. India has leading incubators and accelerators such as 100xVC, Let's Venture, Entrepreneur First. Expanding this network and bringing global accelerators such as YCombinator, 500 Startups, MassChallenge, TechStars to India; connecting them to upcoming Startup hubs such as Hyderabad, Kochi, and IT clusters such as Indore, Ahmedabad, etc. will push the local startup ecosystem towards hyper-growth.

Stimulating entrepreneurship in emerging Startup hubs and IT clusters such as Hyderabad, Kochi, Indore, Ahmedabad than a few concentrated Startup hubs would be a critical lever for the next phase of growth. This will help the startups in managing the cost benefits of setting up infrastructure in the initial stages in non-metro locations, leveraging a large and affordable talent pool locally, and proximity to major manufacturing and MSME hubs.

The next era of Startup growth for the Indian economy would be led by the development of multiple tech nodes and scaling emerging Startup hubs pan India, fuelled by investments in R&D, global mentor networks, and best-in-class local manufacturing capabilities. To leap ahead of leading Startup ecosystems in Asia and globally such as the USA, China, Singapore, Seoul, and Tel Aviv, the R&D ecosystem in India will be a critical enabler for building the funnel of the next generation of Startups and innovators.



## DIGITAL TECHNOLOGY – Backbone of Future Growth

### India – A leader in Public Digital Good

India has been at the forefront of developing digital public infrastructure, which it has used in a variety of fields, including digital identity, finance, and health, in order to improve public services, efficiency, and the standard of living for the average person. Of its many success stories, few notables are

- Aadhar – This unique biometric ID system created a unique digital identity, so far for about 1.2 billion Indians, as backbone of public digital infrastructure
- Digital banking and Financing - e-rupee, linking Aadhar and PAN which is being used for, among others, for direct benefit transfers to crores of beneficiaries. Since its launch in 2014, about 470 million Jan Dhan Accounts have been opened providing access of financial services to hitherto un-serviced population. UPI for digital payment with billions of monthly digital payment transactions is a global success story, now being adopted by many countries.
- Digi-locker – one stop digital storehouse for important documents
- Health – Cowin platform is used for providing more than 200 crore vaccines. Ayushman Bharat Digital Mission is established to set up integrated digital infrastructure for health records to bring multiple service providers to same platform.
- Open Network for Digital Commerce – This is one of its kind platform that aggregates producers (including remote and small ones), buyers, traders, logistic players Retail, access, quality, regulation – Linking the unorganised enterprise – Expanding the reach of market and enhancing consumer choices
- India Stack – It is a revolutionary integrated approach to bring identity and digital transactions for multiple usage through layered APIs.

As India marches through its Amrit Kaal, digital technology will be one of the most effective enablers to deliver its growth aspiration, ease of living for its people and ease of doing business for its producers, traders, and service providers. Although India has already established itself as a global leader in digital public goods and numerous innovative initiatives are now ongoing, it would still need to begin specific actions for avoiding the digital divide and should shift from the adoption of technology to the invention of new technology.

### From Back Office to Front Runner of Technology - Research and Development Centers

- Setting up of Centers of Artificial Intelligence is one such step to encourage AI driven technologies. India would need an umbrella agenda for digital technology research, innovation, and development for technologies on horizon and technologies of future, for next one decade with adequate funding. For this purpose, the country as a whole needs to establish multiple networked centers of excellence, centered on a pre-identified set of technologies that are periodically reviewed, to work together under an overarching agenda with synergy, avoid duplication, and advance the general agenda. The corporates, academia, entrepreneur, and startups will be natural stakeholders of this initiative.

- **Faster adoption of 5G** – Estimates by various research groups on impact of 5G on economy of states may vary but they are unanimous that adoption of 5G will provide better and faster services to the individuals. As per a study by Ericsson<sup>10</sup> “With regulatory and government support, countries could benefit from GDP growth between 0.3% and 0.46% through 2035, with an estimated three-to-seven-fold cost-to-benefit ratio”. Manufacturing, retail, agriculture, health services and entertainment stand to gain most out of the roll out and adoption of 5G. The effort should be on extending the 5G infra to rural areas while keeping the cost of handset and data low for faster adoption.
- **Infrastructure and Software Localisation** – Not only form geo-political, privacy and economic purposes but from security (internal and external), India should aim at complete localisation of all hardware, software and infrastructure within its geographical boundaries. This should include data servers located within India, indigenous operating system and software, communication infrastructure, entertainment and retail platforms among others. Recent collaboration under “Initiative on Critical and Emerging Technologies” with USA on localisation of military hardware, semiconductor, telecommunication and AI is a step in this direction.
- **Avoid Digital Divide** – Access to digital services and financial inclusion are now as basic a need as Roti, Kapda Aur Makaan are. As explained elsewhere in this document positive health outcomes have very strong correlation with access to mobile phone and bank account. Moreover, the ease of availing the services through digital mode and availability of certain services only on digital mode like retail, EdTech, online classes, entertainment, social network provides a distinct advantage to those who can avail and benefit from these digital services. In such a scenario the access to 4G or higher network and a smartphone will assume higher meaning in welfare agenda to avoid digital divide

10. <https://economictimes.indiatimes.com/industry/telecom/telecom-news/indias-5g-rollout-cost-to-be-highest-among-15-emerging-nations-study/articleshow/95773987.cms>

-that is those who have access to digital technology and those who don't have. Governments would have to be conscious and take affirmative actions beyond market forces, to avoid "digital poverty".

- **Digital Public Infrastructure for Agriculture** – The government of India has announced establishing Digital Public Infrastructure for Agriculture as an open source, open standard and inter operable public good to provide variety of services to farmers. This infrastructure should focus on one of the major issues of credit to farmers to enable them to access the desired amount at desired time by providing a credit rating to the farmers and linking financing institutions to them. The infrastructure should also aim to establish a credit rating of the farmer's family as a unit by analysing the family's assets and obligations.
- Government should establish a similar **Digital Public Infrastructure for MSME** for providing easier access to finances, skills, technology and market. This will enable formalisation of the unorganised MSME sector that accounts for more than three fourth of the employment of total sector. GeM (Government eMarket Place) open access digital public good initiative of government of India which is a networked platform, available free of cost, enabling producer, trader and buyer to connect seamlessly for D2C and B2B business transactions avoiding middlemen and providing cost benefits.
- **Cyber Security** – More and more sectors are now dependent on digital infra for their day-to-day operations. Aviation, railways, highway tools, finance, banking, retail, electricity grids, physical security networks, telecommunications, Businesses are extremely vulnerable to cyber threats and fraud because they rely so much on digital infrastructure. Moreover, it is a game of one upmanship requiring continuous development and deployment of security walls to safeguard the critical public and private infra and operations.

## DEEP TECHNOLOGY FOR GROWTH AND WELFARE

Basis analysis of VC investments, R&D trends, and emerging use cases for consumers and enterprises, the next phase of growth will come from advanced segments of Deep Technology with the intersection of basic science, and technologies like Artificial Intelligence and related, Big Data, Advanced Manufacturing, Robotics, Blockchain, Space Tech, etc.<sup>11/12/13</sup> and Design concepts. Product development and commercialization in these segments require heavy investments in research and supporting infrastructure for development and prototyping. Competing in these advanced segments requires a high level of R&D investments for developing the technology and building intellectual property.

Mature Phase	Emerging & Growth
Agtech & New Food	AI & Big Data
Cleantech	Blockchain
B2B SaaS	Advanced Manufacturing and Robotics
Cybersecurity	Spacetechn
Fintech	Hyperscale Edge Computing
Gaming	Immersive Internet & Metaverse
Life Sciences	Superapps
EdTech	Sustainable technology to enable ESG Outcomes\
Digital Media	

Advances and new products developed through deep technologies will impact all walks of life. Some of the areas where we can soon see the developments are listed below for indicative purposes.

**E-Governance and Citizen Services:** - Robust single window AI & Blockchain driven e-governance platforms for seamless access to government services, Technology for transparent and efficient delivery of essential services.

**Health Care and Well-being** - Telemedicine for remote health monitoring and accessibility, AI for disease detection and personalized medicine

**Sustainable Agriculture and Food Security** – Precision agriculture, through IoT and data analytics to optimize crop yields, credit access, digital platforms for farmers to access market information and fair prices, drones, sensors, and data analytics should be adopted to optimize crop yields, monitor soil conditions, and manage resources efficiently at scale.

**Logistics:** Transforming the logistics industry by leveraging Blockchain, Fintech, AI, robotics, and automation to optimize supply chains, enhance last-mile delivery, and improve customer experiences. Also, develop advanced solutions for supply chain optimization, asset tracking, and real-time monitoring, benefiting agriculture, shipping, and transportation industries.

**Utilities:** The deployment of smart grids and Internet of Things (IoT) technologies to improve energy efficiency,

11. Bain Venture Capital Report 2021 & 2022 | 12. Bain India SaaS Report 2021, Deloitte Tech Trends, Gartner's Top Strategic Technology Trends 2023  
13. Analysis of data of Startup Investments FY2019-23 across sources

monitor and manage utilities in real-time, and integrate renewable energy sources into the power grid. Also, focus on water management technologies, given its arid climate. We must create a startup eco-system for water-efficient irrigation systems, leak detection solutions, and desalination technologies.

**Clean Energy:** Focus on renewable energy technologies, including solar power, storage, and innovative solutions for sustainable energy production and consumption

**Education:** EdTech platforms in harness personalized learning using AI, virtual reality (VR), and online learning tools to provide personalized and interactive educational experiences, reaching a broader audience and enabling lifelong learning, enabling advanced and relevant education for the remotest of remote parts of the state.

**Infrastructure:** Use of IoT and sensor technologies for smart city & smart village initiatives, enhancing urban planning, traffic management, waste management, and public safety.

**Financial Services:** Embraced FinTech innovations, including blockchain technology for secure transactions and digital payments, robo-advisors for automated financial planning, and AI-driven risk assessment for lending.

**Manufacturing:** Industry 4.0 initiatives involve the integration of IoT, AI, and automation in manufacturing processes, leading to smart factories, predictive maintenance, and improved productivity.

**Entertainment:** Augmented reality (AR) and virtual reality (VR) have transformed the gaming and entertainment industries globally, providing immersive experiences and new forms of storytelling. Create Gaming Parks and enable support for tier-2 cities to create jobs and live-service studios for global outsourcing.

**Cybersecurity:** Developing advanced solutions to protect critical infrastructure, networks, and digital assets from cyber threats.

**Aerospace and Defense:** Advanced military technologies, including drone systems, missile defense systems, and satellite technologies, eco-systems to be created.

**Automotive:** Development of autonomous vehicle technologies, including computer vision, AI, and sensor integration for self-driving cars.

**Biotechnology:** Build a hub for biotech startups, leveraging genetic research, personalized medicine, and medical innovations.

In two decades from now, we will be using the products that are hitherto unknown and these products will drive the global value chains. Share in global value chains will be strongly dependent on competitiveness and innovation and therefore contribute a substantial share in the future to GDP which will come from research and innovation. Arguably, India's role and performance in research, innovation, creation of KBC and disruptive technology will largely determine the growth path of India, Indians and Indian companies.





