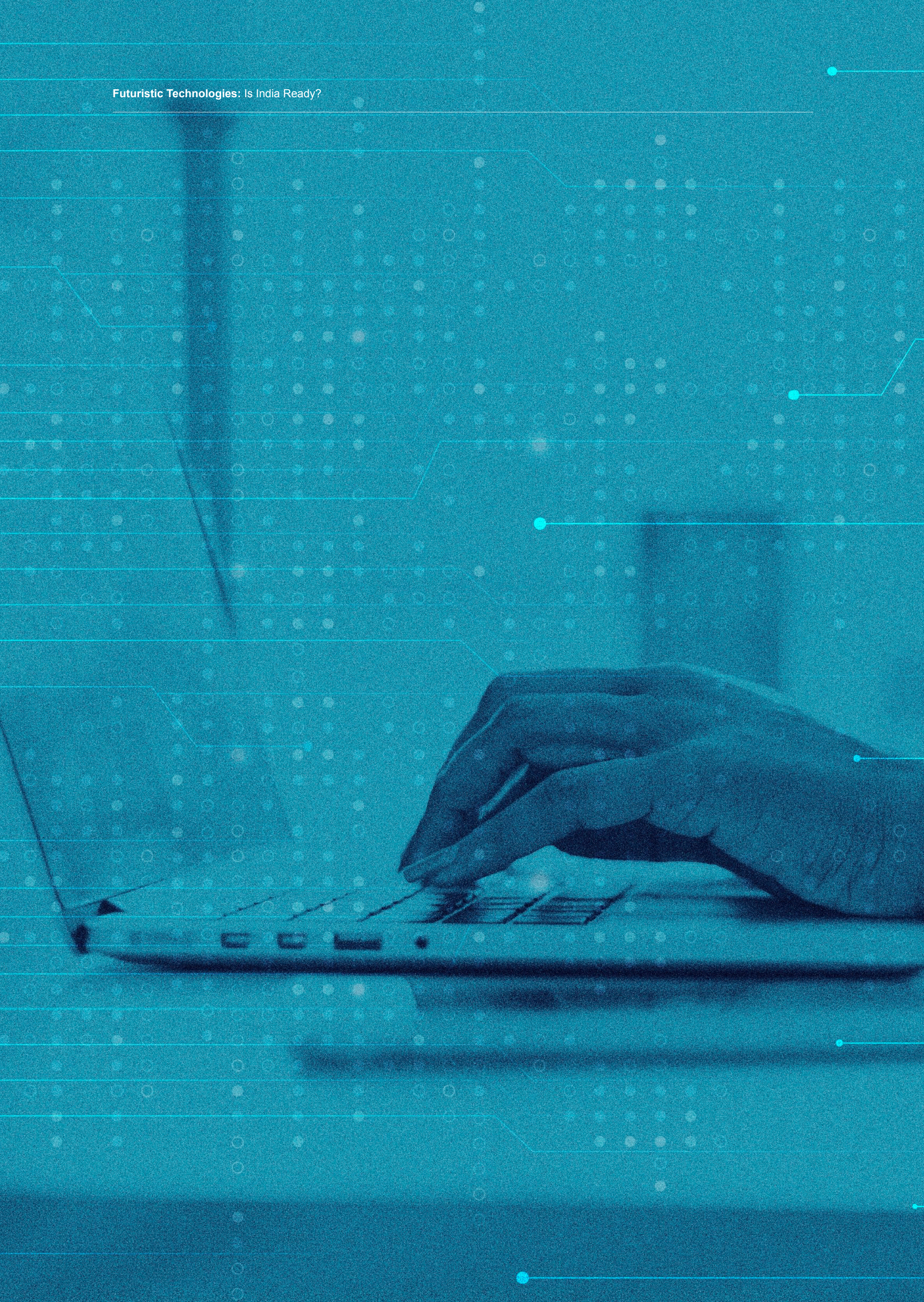
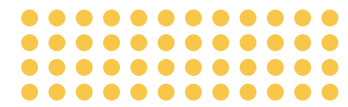
A person wearing a VR headset is shown in profile, looking towards the right. Their right hand is raised, with the index finger pointing upwards. The background is dark with glowing blue hexagonal patterns and a bright blue light source on the left. The overall color palette is dominated by blue and purple hues.

Futuristic Technologies Is India Ready?

November 2022



Message from ASSOCHAM



Technology has made incredible strides in the last ten years that are still changing our world. Today, it serves as the basis for all potential future expansion, and it is the basis which can be used to mend the present and build a more inclusive and sustainable society. The world is experiencing a digital revolution because of cutting-edge innovations like the metaverse, the network of the future (5G & 6G), and quantum computing that are upending and reconstructing our realities and the future as we know it.

As of today, more than 4.33 billion people actively use the internet. That's a staggering 56% of the world's population, with India coming in second. Technology in India is advancing at a very rapid rate, and it is changing the way we communicate, how we pay our bills, and the way we entertain ourselves.

The combination of these technological breakthroughs is the Fourth Industrial Revolution. What we see today is a world that is changing and adjusting to the confusion brought on by new and expanding technology. Customers have been open to adopting the improvements that these technologies have brought forth to make our daily lives easier.

By adopting tech-led innovations and allowing tech enablers to collect more data for customized and improvised experiences, we, as consumers, have played a critical role in maximizing the impact of these technologies. This is true from the era of smart devices to the connected devices to that of connected experiences.

Today, India is in a good position to strengthen its position as a global leader in the post-fourth industrial revolution era because it has one of the youngest labour forces in the world, a sizable amount of technical aptitude, the second-highest percentage of mobile internet users, and the second-highest percentage of English speakers.

India can lead this tech revolution while improving the quality, equality, and sustainability of its own economic and development results with the right combination of regulatory frameworks, educational ecosystems, and government incentives at the same time.

This report talks about new-age digital technologies and how various initiatives and policies by the Government can drive growth. We hope this report will support the Government in transforming the ever-evolving technology sector in the country and provide inputs to corporates in understanding and realizing the full potential of futuristic technologies.

The report shares the views of citizens, industry experts and culminates in actionable recommendations for policy makers and corporates. The report highlights need for focus on technical education and skill development in Web3 areas, creating training and awareness programs around cyber security including incorporating in school and college level learnings, focus on developing R&D capabilities in critical areas such as 5G components which can be used to enhance India's position globally. We hope that you find this report useful and its sets in motion discussions and deliberations in the field of futuristic technologies.

Mr Deepak Sood
Secretary General,
ASSOCHAM



Foreword



The Indian technological environment has undergone a significant transition during the last 20 years. The introduction of cutting-edge technology has elevated the position of business players, who are now more than just providers of services but also enablers of the nation's growing digital revolution.

The IT business is growing tremendously due to expanding Indian economy and the strict measures being taken to accelerate the adoption of new technology. The world has changed dramatically as a result of the remarkable advancement in technology over the past few decades. Today, we have a wide range of tools at our disposal that allow us to quickly access any information. The world will undergo a revolution brought on by technical advancements in the next decade if everything proceeds at the same rate. Therefore, in order to maximise benefits, India will increasingly need to plan, implement, and use next-generation technologies like artificial intelligence, smart cities, blockchain, and the internet of things.

This report by Assocham and Primus Partners would provide authorities, tech-aggregators, and governments with clear points to ponder and act upon so that the trends in technology can be applied to reimagine and bring the businesses on the right platform to lead the change that is needed for the organizations, people, and the world. We endeavour to provide the stakeholders with clear-cut recommendations and learnings so that we can find new ways of working and interacting, add much-needed adaptability and resilience, create new experiences and ways of doing business.

The report has been prepared with inputs from citizen, research and analysis by Assocham and Primus Partners and views of various experts. This would provide a well-rounded view of all the subjects covered as part of the report. The report has looked at various cutting edge and futuristic technologies like Blockchain, AI/ML, Web3.0, Cloud, Metaverse. It has also looked at uses of the new age technologies across industries and its impact on sunrise segments like Fintech. Challenges that some of these face including potential cyber attacks have also been studied and represented in the report.



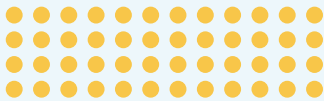
Devroop Dhar
Managing Director
Primus Partners





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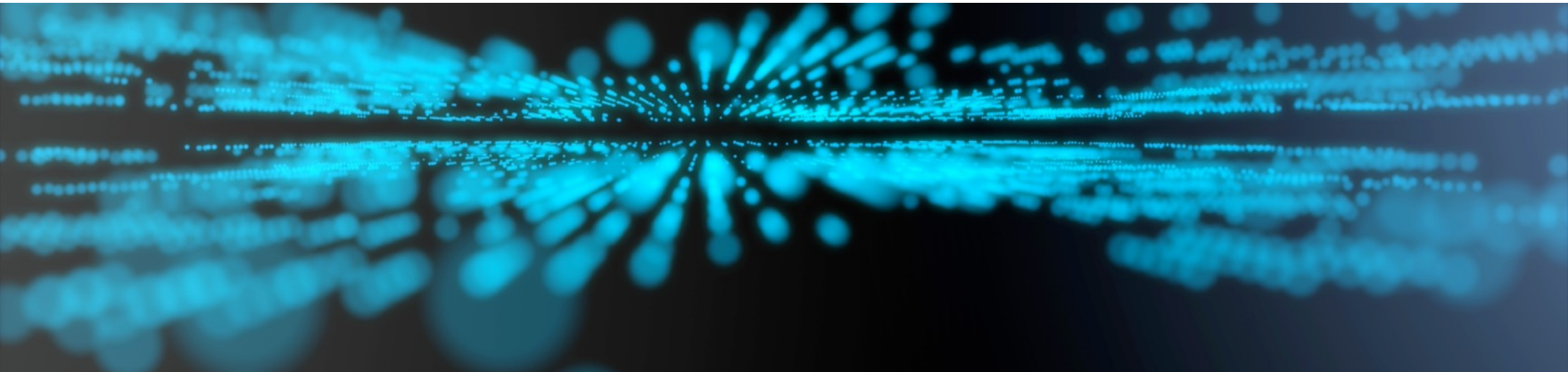
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1 New-Age Digital Technologies would drive the future



“The value of the Indian digital economy will reach \$1 trillion by 2025.”

– Hon. Prime Minister Shri Narendra Modi



India is a global technology and digital powerhouse. The Indian technology industry crossed more than USD 200 billion in revenue in FY 22 and is poised for strong growth. It accounts for about 8% of the GDP of the country. The digital economy in India is expected to reach USD 1 trillion in the next 3 years, making it one of the largest digital economies in the world.¹

The last few years has seen unprecedented opportunities and new cutting edge technologies being introduced and adopted across private and government sectors. Some of the futuristic technologies which are seeing adoption include:

-  Blockchain
-  Artificial Intelligence & Machine Learning
-  Internet of Things
-  Cloud Technology

Is India ready for futuristic technologies?

Citizen feedback was taken from about 300 citizens throughout the country across a wide array of age groups, occupation, income levels, education to gauge the mood of the country. 96% of the citizens had heard of cutting-edge and futuristic technologies and more than 90% feel that futuristic technologies would be important or very important for India.

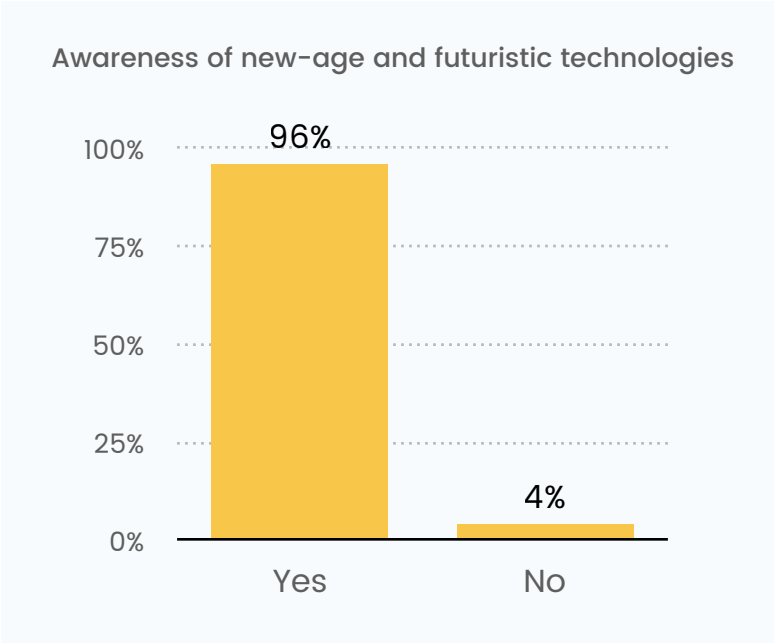


Fig 1: Present Awareness of New Technologies

¹ <https://www.business-standard.com/>

Fig 3

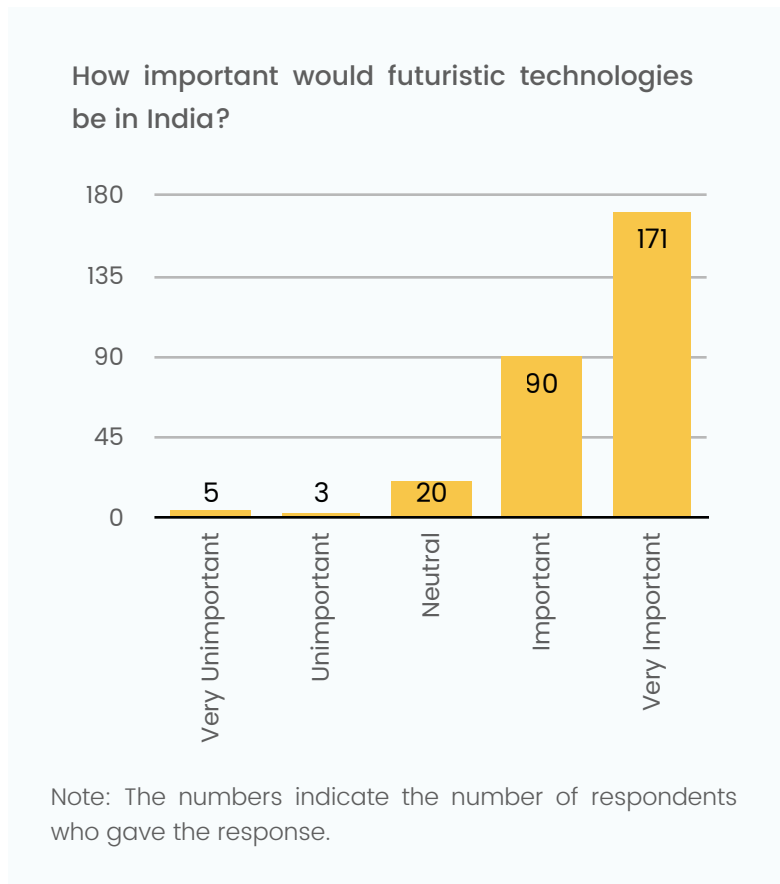


Fig 2: Importance of New Technologies

More than 97% of the respondents felt that futuristic technologies would have a positive impact, and would make life easier, save time and cost in future.

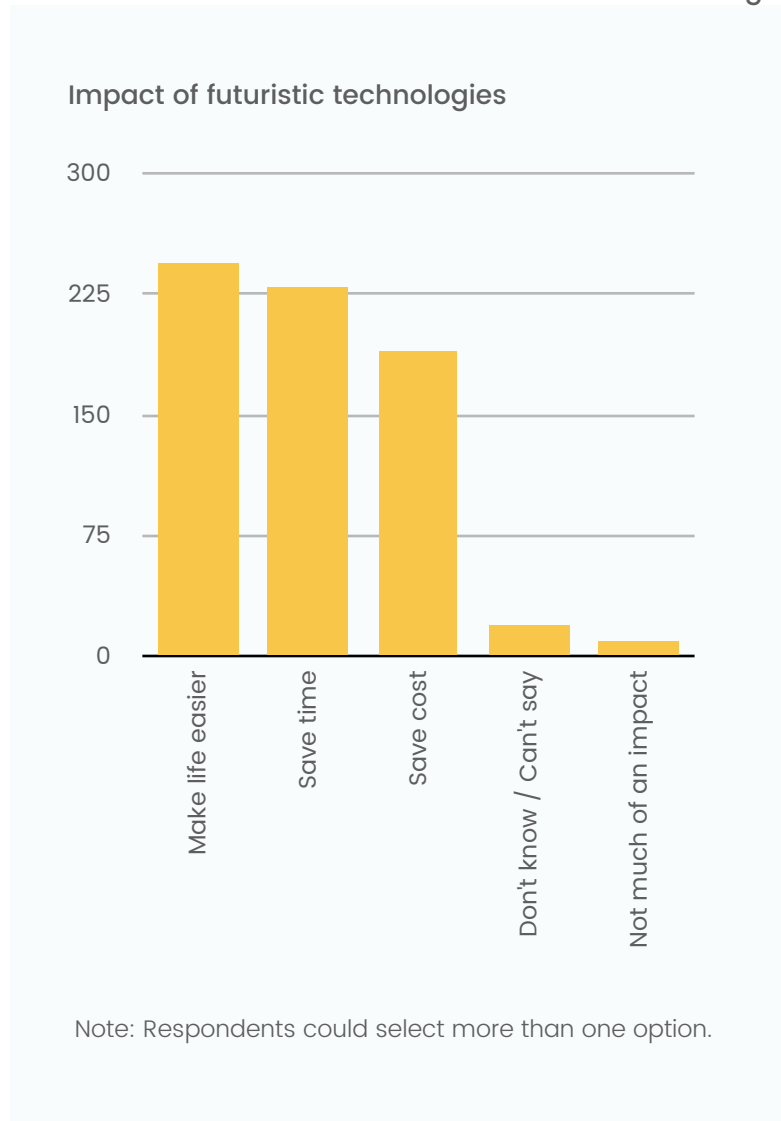


Fig 3: Impact of Futuristic Technologies

However, people also felt there would be challenges in implementation as well with understanding of technology, cyber attacks and internet speed seen as top challenges.

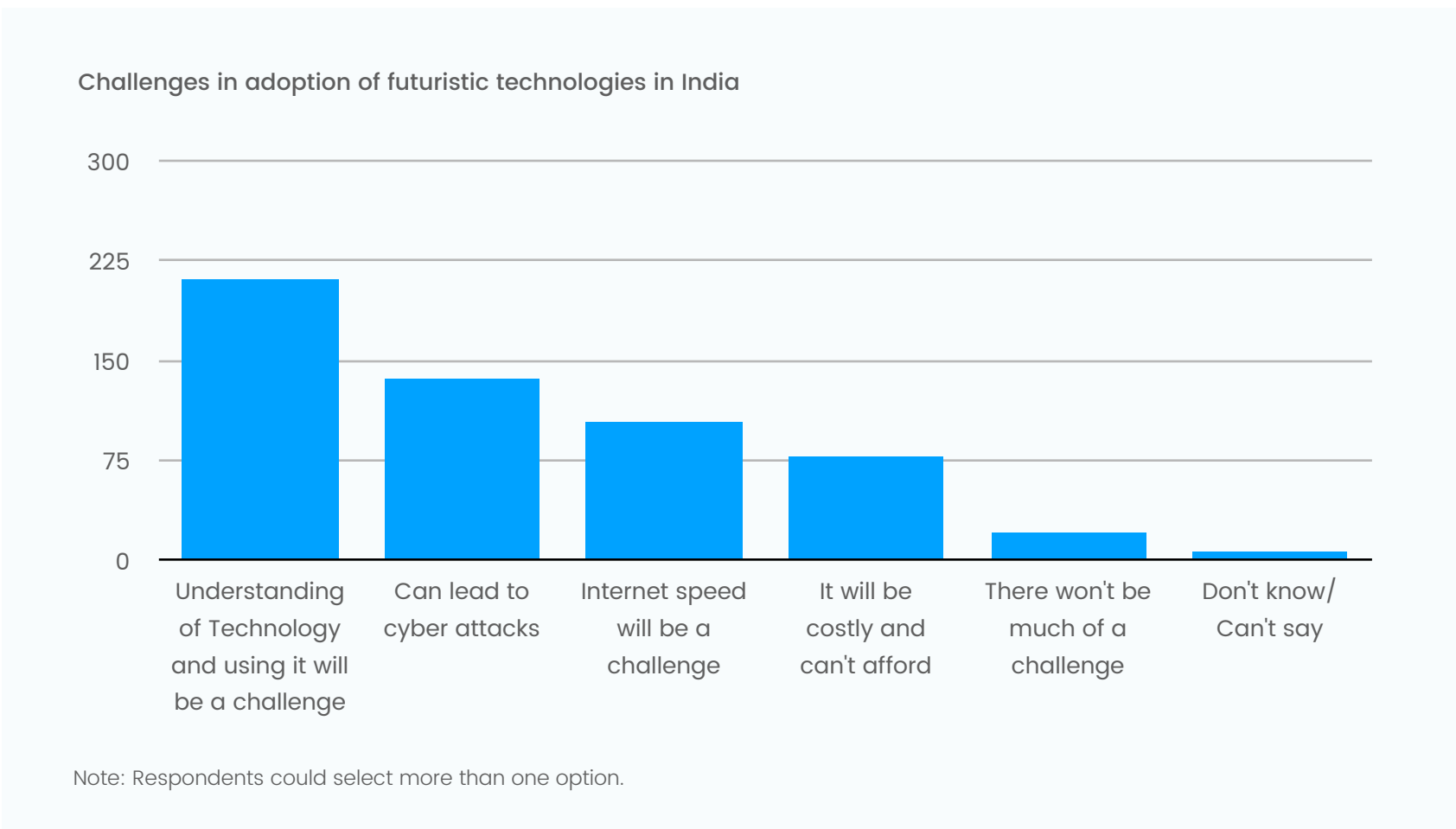


Fig 4: Major Challenges in adoption of new technologies

What are the new age and futuristic technologies?



Blockchain

A blockchain is made up of two main parts: an immutable ledger that network maintains and a decentralised network that facilitates and verifies transactions. There is no single point of failure where data may be hacked or corrupted, and everyone on the network can see this shared transaction ledger. Every type of digital record and transaction may benefit from the distributed ledger technology that powers blockchain, and big businesses are already starting to embrace the change.

Big banks and IT giants are the first ones to utilize this technology. Innovation will always be fuelled by big businesses, and the emergence of blockchain-based smart contracts has transformed the technology into a middleman for carrying out a variety of intricate corporate transactions, legal contracts, and automated data exchanges.



Blockchain anchored caste certificate was implemented and issued in the Etapalli sub-division of Gadchiroli district of Maharashtra.



The New Town Kolkata Development Authority (NKDA) in Bengal is planning to use NFTs for maintaining land records in the city and is looking at applications to develop Municipal Property Registration Certificates using Non-Fungible Tokens (NFTs) based on Blockchain.



Artificial Intelligence

As per the estimates by Niti Aayog, artificial intelligence would contribute roughly around 1 trillion USD to the Indian economy by 2035. These figures demonstrate the financial potential of this advanced technology.

The beginning of Artificial Intelligence (AI) has led to the next wave of automation. It has allowed businesses to reduce human interaction and drive growth by modernising business processes and producing cognitive insights. Deep-learning algorithms make it easier to analyse past behaviour to forecast clients' future purchasing decisions. Digital platforms powered by AI, like chatbots, have created new opportunities for elevating consumer experience. These chatbots support the task that was previously commonly carried out through call centres by acting as a conversational interface.

Presently, only around one-third of organisations in India are now using AI, placing the country's market in its infancy. However, in the years to come, this figure is expected to rise as organisations gradually become aware of the enormous potential this technology to completely change business strategies. With automated cars, innovative learning methods, and specialised remedial facilities, AI is predicted to dominate the market in the future.



IRCTC developed and implemented AI powered Chatbot called ASK DISHA for customer facilitation in its internet ticketing site. The AI powered chatbot & virtual assistants using the technologies of Machine Learning (ML) and Natural Language Processing (NLP) in addition to AI has helped IRCTC to respond to customer queries regarding their travel and helped improve customer satisfaction by 70%.



Vodafone has been able to automate 66% of the company's consumer interaction, allowing customer support agents to concentrate on strategic tasks, resulting in growth and productivity throughout the firm. It's machine learning chatbot named 'TOBI' has been launched in 11 popular markets.

Internet of Things

The daily operations of businesses have been revolutionised by the use of internet of things (IoT) technology. Smart devices with IoT capabilities offer in-depth insights that enable businesses to adapt to changing client needs. The technology is being steadily adopted by businesses across a variety of sectors, from healthcare and manufacturing to transportation and logistics, in order to simplify operations, save more time and money, and offer customers new value propositions. India is also seeing a remarkable increase in IoT use. In reality, the government's initiatives like the Digital India programme and the Smart Cities Mission are boosting demand for IoT goods and services.

Public spaces: Increasing public safety by monitoring public spaces including emergency response operations through connected security cameras, and interpreting data through modern AI solutions.

Traffic Management: The data taken from CCTV feeds and transfer vehicle-related data has been used by City traffic departments to develop better-organized traffic systems that result in a smoother flow of traffic and fewer idle automobiles, buses, and trucks stuck in traffic jams.



Cloud Technology

The use of cloud computing is rapidly expanding in this nation. India is the second largest and fastest-expanding market for cloud services in the Asia-Pacific region, only behind China. Cloud computing, in its broadest sense, refers to the provision of IT services via the internet without the use of extra infrastructure. Instead of creating local servers or personal devices to handle applications, it depends on the idea of sharing computing resources. Businesses may use data more effectively and economically, thanks to cloud computing's on-demand availability, scalability, and supercomputing features.

According to recent research reports, Cloud Infrastructure Market in India was valued at INR 30,140 Cr. in 2020 and is expected to grow at a CAGR of 29% between 2021-2025 reaching to INR 116,923 Cr. by 2025.



Government of India has launched its own cloud called Meghraj, thus making e-Service delivery more convenient for service providers and citizens.



India presently has more than 700 MW of IT capacity of data centres, with a major part of it focused on cloud services.



Large hyperscalers like AWS are all present in India and are expanding their capacity in the country.



Mr Amitabh Ray

Chairman, Technology Sector Council East, ASSOCHAM
and Managing Director, Ericsson Global Services

EXPERT VIEW

Navigating Permacrisis with technology

It has been over two years since the pandemic created an unparalleled turbulence in our lives. Just when things were about to normalize, the world was engulfed in a geopolitical turmoil that once again unleashed a tidal wave of uncertainty. We are now witnessing a confluence of hugely disruptive headwinds across the political, economic, social, business, and technological landscape. A year ago, Big Tech was leading the stock indices with their earnings, today it is Big Oil. The pendulum is swinging so wildly that the English language had had to add a new word to it, “permacrisis.”

Businesses are impacted as energy costs soar, inflation erodes buying power of consumers, supply chains are redrawn reversing globalization, economic costs of climate change mount, food insecurity threatens large swathes of the population, and techno-nationalism fracture the world into blocs that are at conflict with each other. Global growth is forecast to slow from 6.0% in 2021 to 3.2% in 2022 and 2.7% in 2023. This is the weakest growth profile since 2001 except for the global financial crisis and the acute phase of the COVID-19 pandemic. The fallout from these trends will last for years to come. It's in this context we must look at emerging technologies to leverage those to navigate uncertainties.

Post-COVID challenges

Organizations had accelerated their digital transformation during the pandemic, they are now having to grapple with new challenges. Every crisis brings in its wake a surge of new technologies. 5G will be a force for enterprises to usher in large scale application of Internet of Things in manufacturing, to optimize costs and automate processes. Incredible advances in artificial intelligence (AI) and machine learning (ML) will unlock new economic value as organizations adopt data-driven decision processes thereby minimizing risks.

Artificial Intelligence the new electricity

While the commonly held view is that insights are the key benefit of AI, the real worth of AI is that it creates value by improving the quality of decisions. The good news is the opportunities for it to do that in business are countless. But because decisions in one area of an organization usually have an impact on decisions in other areas, introducing AI often entails redesigning whole systems. In that way, AI is similar to groundbreaking technologies of the past, like electricity, which initially was used only narrowly but ultimately transformed manufacturing.

Decisions involve a combination of prediction and judgment, and because AI makes highly accurate predictions, it will shift decision rights to where judgment is still needed, potentially changing who makes decisions and where, when, and how. More-accurate predictions in one part of a value chain will also have ripple effects on other parts.

EXPERT VIEW

Clean-Tech: A Business Imperative

As ESG (environment-society-governance) becomes a business imperative and also a strategy to adopt energy saving technologies, Clean-Tech will find greater acceptance and investments in this will become essential to improve efficiencies, and also send out encouraging signals to customers and Gen Z stakeholders, including employees and customers, for whom this has become an important measure to evaluate companies.

According to the IEA (International Energy Agency), record-setting green energy spending is helping global energy investment grow by 8% in 2022, reaching US\$2.4 trillion (the anticipated increase is primarily due to clean energy investments). Renewable energy has become increasingly cost competitive with fossil fuels. There is also a vast economic engine behind sustaining the use of fossil fuels, despite the science supporting their contributions to global warming. At the same time, we find countries moving towards large scale adoption of electric vehicles in the next 10 years.

5G is not just any G

ABI Research has found that 5G deployments in manufacturing, logistics, transportation, and consumer verticals can increase energy efficiency and reduce Carbon Dioxide (CO₂) emissions by 20 gigatons by 2030. In manufacturing, for example, a single smart factory using 5G for predictive, preventive, and remote maintenance, in combination with the deployment of Automated Guided Vehicles (AGVs), can expect to save approximately 103 tons of CO₂ emissions by 2030. 5G is likely to benefit the Indian economy by US\$455 billion between 2023 and 2040, per a GSMA report. The benefit of 5G technology is expected to be realised in the manufacturing sector (representing 20 % of the total benefit), retail (12 %)

Navigating Permacrisis with technology

and agriculture (11%).

5G connectivity can mitigate the very same supply chain problems that enterprises are facing now, particularly because a proper integration of public and private cellular network infrastructure and roaming agreements can give enterprises access to nearly global connectivity. By combining these capabilities with large-scale adoption of AI and ML technologies, enterprises will be able to detect supply chain anomalies and disruptions in order to adjust workflows as early as possible. Advancements of satellite technologies have created exciting new opportunities in locating, tracking, and monitoring of supply chains. Private satellites will play an important role in future communication technologies in taking connectivity to hitherto inaccessible areas. This will create new opportunities that will be inclusive and go a long way in reducing economic inequalities. Remote healthcare will not only create new business opportunities, but will help reaching the benefits of modern healthcare to those who need it the most.

Finding right talent, a key challenge

AI has the potential to add US\$957 billion, or 15% of India's current gross value in 2035. The combination of the technology, data and talent that make intelligent systems possible has reached critical mass, driving extraordinary growth in AI investment. New solution architectures like edge computing and more efficient Deep Learning (DL) models make AI more accessible and high-performance than ever. Understanding the importance of AI compute, countries are also committing significant resources to AI chipset design and development. However, finding analytics talent will remain a key challenge that companies will have to overcome. Adoption of AI / ML to create a data-driven organisation must be high on the charter of every CEO.

EXPERT VIEW

Even with a tech-savvy talent pool, renowned universities, healthy levels of entrepreneurship and strong corporations, India lags on key indicators of AI development. The stakes are high. The country remains the most competitive in South Asia yet trails many other G20 countries in AI. That is despite Indian companies adopting AI technology at a larger scale, the country's investments in tech infrastructure and the improving tech skills of its citizens.

Location technology for supply chain

A surge in commodity and energy prices, fueled by the war in Ukraine and affecting an already vulnerable COVID-19 economy, the expected post-pandemic economic boom now looks like the start of a global recession. Knock-on effects can be seen around the world with national economies (e.g., Sri Lanka) suffering greatly and the United States recording a 40-year high inflation rate of 9.1% in May. Now is a crucial time for location technology, specifically in the RTLS (Real-Time-Location-Systems) and 5G spaces, to manage supply chains. There is clear need for asset visibility enabled by location solutions. Asset tracking is a major use case and the need for affordable, low-power, and low-complexity devices is driving innovation across almost every location technology.

Building a resilient organization

The list of technologies that will have profound impact on business, ranges from blockchain, quantum computing, to brain-computer interfaces

Navigating Permacrisis with technology

which are in their early stages of adoption. but the pace of development is quickening at an exponential rate every day. The best way out of a downturn, they say, is to continue investing — but only if you pick the right areas. Prioritize investments that maximize revenue growth, profitability, and resilience. This includes targeted and coordinated investments in technology, talent, and insights that help drive customer value and will accelerate differentiation coming out of the downturn.

The next year is unlikely to look like the 2020 shutdown or any past recession, rendering many assumptions about your customers and their behavior useless. The ideal strategy will be to invest in more relevant and reliable customer data to help sharpen your audience, targeting strategy and shift budgets to higher-yielding tactics with proven financial value. While the pandemic pushed the need for tech for new digital experiences and anywhere work, the current economic headwinds will demand more focus on tech tuned for optimization and resilience. But this doesn't mean you should dial back on digital experience innovation. Keep pushing forward, but prioritize investments that also reduce operational costs.

The most important business lessons learned during 2020 is that technology can be an important tool to navigate uncertainty. Companies that embrace, invest in, and deploy technology wisely will no doubt emerge stronger and better prepared to handle the next spate of challenges on the horizon, no matter the weather.

Mr Amitabh Ray

Chairman, Technology Sector Council East, ASSOCHAM, and Managing Director, Ericsson Global Services

Our View

India is ready for adoption of futuristic technologies and have all the right ingredients in place for it:



Favourable Demographics: With more than 50 per cent of its population under the age of 27, India has one-fifth of world's young population.



Growing economy: India is the fifth largest economy in the world and is poised to be the third largest by the end of the decade. India is also the third largest economy by PPP



Availability of Talent Pool: Over time, India's digital talent pool has grown and now makes up around 75% of the world's digital talent. The four major Indian IT firms TCS, Infosys, Wipro, and HCL Tech collectively employ over a million people. ²



Mobile penetration: The smartphone penetration in India is around 60% and is expected to reach 95% over the next 15 years. ³



Internet penetration: The internet penetration in the country is around 47% and the number of internet users is expected to grow to 900 million by 2025. ⁴



5G rollout: 5G rollout started last month and is expected to cover the entire country in the next 2-4 years.



Start-Up Ecosystem: India is the third-largest start-up ecosystem in the world, and it is anticipated that it will expand by 12-15% annually YoY. ⁵ In 2018, there were roughly 50,000 start-ups in India, of which 8,900-9,300 focused on technology. There were 1300 new tech start-ups in just 2019, which suggests that 2-3 new tech start-ups are created every day. As of 2022, there are roughly 107 unicorns. Over the course of a year, start-ups in the nation were able to add an estimated 40,000 new jobs, bringing the overall number of jobs in the start-up ecosystem to 1.6-1.7 lakh.

While there is immense potential in adopting futuristic technologies in India and the country is well poised for it, however focus should also be on skill enhancement, training and education to ensure that we have skilled workforce to be able to contribute to this ever-rising area.

² <https://economictimes.indiatimes.com/>

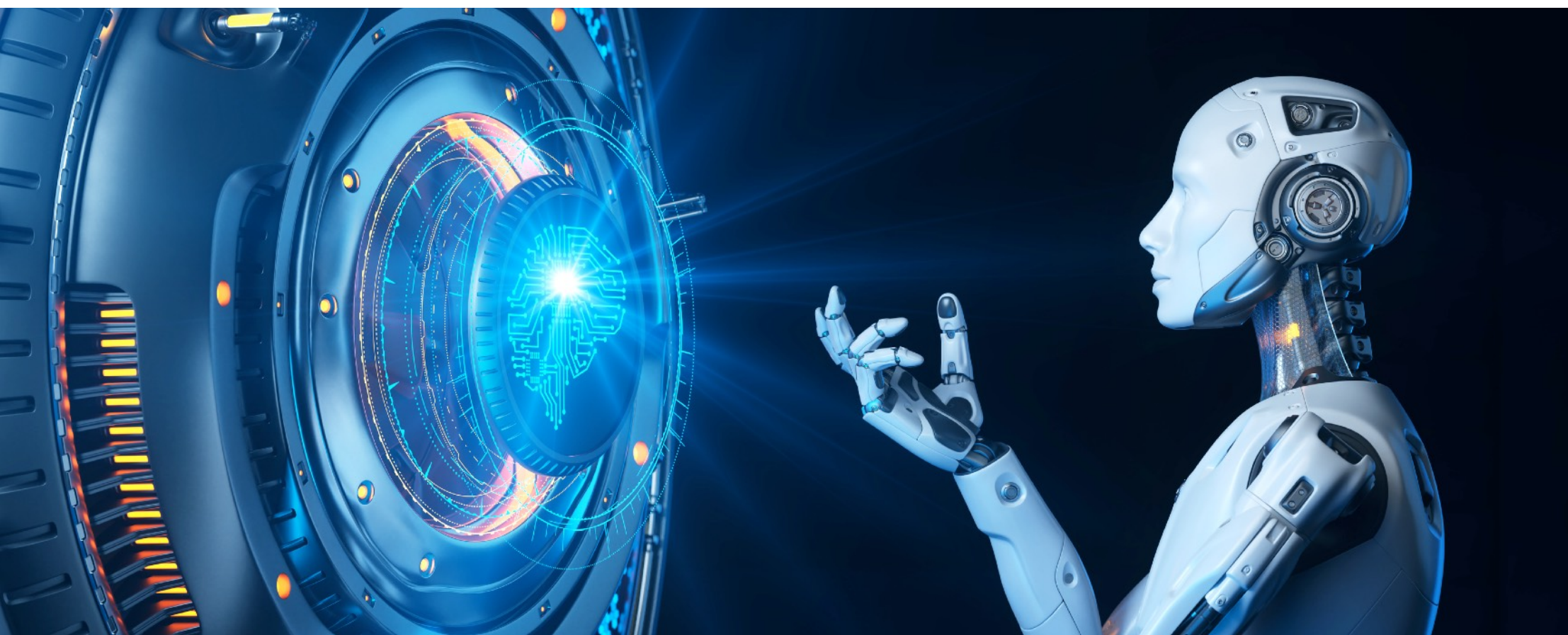
³ <https://www.thehindu.com/>

⁴ <https://www.statista.com/>

⁵ <https://www.nextias.com/>

2 Policy enablement shall be the key to drive growth in new age technologies

Government of India and many of the State Governments have brought policies to support futuristic technologies like AI and Blockchain.



A critical aspect that would drive success of implementation of futuristic technologies like AI, Blockchain, IOT, Cloud would be supporting and enabling policies for the same. According to a report by MEITY, India has the ability to create up to \$1 trillion of economic value from the digital economy by 2025, with half of the opportunity originating in new digital ecosystems that can spring up in diverse sectors of the economy. The potential five-fold increase in economic value from India's digital transformation by 2025 would create a rapidly growing market for a host of digital services, platforms, applications, content, and solutions. The public sector has been a strong catalyst for India's rapid digitization.

Digital technologies can contribute significant value towards areas such as online transactions, government subsidy transfers, and procurement to enhance efficiency and productivity in Government and public-sector units. The National and State governments can drive digitization through a partnership with the private sector, placing technology at the core of their operations.

Therefore, for any country to create an optimum economic value in the digital economy, it is imperative for Governments (both National and State) to support the adoption of emerging technologies at policy level.

Global Perspective

Globally, countries such as the US, UK, Singapore and China have been pioneers in developing policies that support the adoption of futuristic technologies such as Blockchain, IoT, AI and Cloud computing. These nations have understood the disruptive nature of these technologies and its substantial ease of processes across various spectrums including governance.

Some examples include:



USA: In 2019, President Trump signed an Executive Order to launch the American AI Initiative



UK: In 2018, UK govt issued its national AI strategy, "AI Sector Deal". In Oct 2022, the UK Government has introduced a bill that could see it adopt blockchain technology as a way to store documents.



China: Announced a Next-Gen AI Development plan in 2017 – aim to become primary center for AI driven innovation by 2030. Beijing announced a US\$2.1 billion AI-centric technology park and Tianjin plans to set up a US\$16 billion AI fund.



Singapore: In 2017, Singapore launched a 5-year, SGD150 million national program, AI Singapore

Policy support: An Indian Perspective

According to the NITI Aayog, AI has the potential of adding \$957 billion to India's GDP by 2035, accelerating its annual growth by 1.3%.

The 'National Strategy on Blockchain' as brought out by the Ministry of Electronics and Information Technology (MeitY), Government of India, is the move in the direction towards enabling trusted digital platforms creating blockchain framework for

the development of applications based on this technology. This strategy document envisages the creation of the National Blockchain Platform and development of various applications using the platform. The strategy also seeks to help the state government to develop state-specific blockchain applications on the shared blockchain infrastructure. Additionally, MeitY has supported a multi-institutional project titled "Distributed Centre of Excellence in Blockchain Technology" with C-DAC, Institute for Development & Research in Banking Technology (IDRBT), Hyderabad and Veermata Jijabai Technological Institute (VJTI), Mumbai as executing agencies. As part of this initiative, agencies have carried out research on the use of Blockchain technology in various domains and developed Proof-of-Concept solutions.⁶

Further to this, NITI Aayog has recognized Blockchain as a promising Technology enabling features such as decentralization, transparency & accountability. NITI Aayog has executed various use cases in Blockchain Technology and piloted them in association with various Government departments and Private agencies. These use cases include land records, pharmaceutical supply chain, fertilizer subsidy disbursement, educational certificates.



इलेक्ट्रॉनिक्स एवं सूचना प्रौद्योगिकी मंत्रालय
MINISTRY OF
ELECTRONICS AND
INFORMATION TECHNOLOGY



NITI Aayog


As part of MeitY, generic blockchain based Proof-of Existence (PoE) Framework has been developed to enable PoE for digital artifacts, used to check the integrity of academic certificates, sale deed documents, MoUs, etc. This PoE framework has facilitated the development of a solution to authenticate academic certificates and is being piloted at the C-DAC Advanced Computing Training School (ACTS) and also for issuing the participation certificates while conducting online seminars and workshops.

NITI Aayog is working on various Blockchain use cases. NITI Aayog in collaboration with Gujarat Narmada Valley Fertilizers & Chemicals Limited (GNFC) has developed a Blockchain based system for fertilizer subsidy.


⁶ <https://www.meity.gov.in>

The National Strategy on AI was released by NITI Aayog back in early 2021. The vision document had sought to highlight the potential of AI to solve social issues in a host of domains. Additionally, policy-level initiatives by the Ministry of Electronics and Information Technology (MeitY) and programmes around AI by NASSCOM and Defence Research & Development Organization (DRDO) have laid the groundwork for future disruption and created a roadmap for AI in India.

Responsible AI for Youth is a national programme for government schools to empower the young generation to become AI-ready and reduce the skill gap in India. Established by the National e-Governance Division of MeitY, the platform aims to help the students develop a new-age tech mindset and relevant skill sets. Furthermore, **NRF, an autonomous body under the new National Education Policy (NEP) 2020, has been established to boost research across segments, including blockchain, IoT, Cloud computing, robotics and AI.** The National Council of Educational Research and Training (NCERT) is preparing a new National Curriculum Framework for School Education in pursuance of the National Education Policy 2020 wherein provision has been made to introduce basic courses on futuristic technologies at the secondary level. ⁷




**MINISTRY OF
CORPORATE
AFFAIRS**
GOVERNMENT OF INDIA




The Ministry of Corporate Affairs (MCA) recently launched a new version of its portal, version 3.0, MCA 21, which will leverage data analytics, AI, and ML, to simplify regulatory filings for companies in order to promote ease of doing business and compliance monitoring. The Centre for Artificial Intelligence and Robotics (CAIR), a laboratory of the DRDO that focuses on research and development in AI, robotics, command and control, networking, information and communication security. CAIR shoots for the development of mission-critical products for battlefield communication and management systems.

In 2015, the Government of India had formulated a Draft IoT Policy with a vision to develop connected and smart IoT based system for the country's economy, society, environment and global needs. This Policy launched a Smart City project, with a plan of developing 100 smart cities in the country, by allocating INR 7,060 crores for the same. In continuation of this endeavour, the launch of the Digital India Program aims to transform the Indian society into a digitally empowered society and boost the IoT industry. The proposed smart cities shall consist of smart homes, smart parking, smart phone detection, smart transportation, smart roads and smart lighting ⁸.

In the sector of cloud computing, the Government of India, launched a policy named GI Cloud, which was later coined as "Meghraj". The focus of this initiative is to accelerate delivery of e-services in the country while optimizing ICT spending of the Government. MeitY has embarked upon several initiatives in order to proliferate the Cloud adoption across the various departments and agencies and streamline the processes involved.



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futureskills[®]
— prime
A MeitY - NASSCOM Digital Skilling Initiative

MeitY has approved Rs 436.87 Crore for implementation of the Project Titled FutureSkill PRIME which aims to create an ecosystem reskilling/upskilling ecosystem in ten emerging and futuristic technologies including IoT.

⁷ <https://inc42.com/>

⁸ <https://nielit.gov.in/>

State level policy interventions on futuristic technologies



West Bengal

West Bengal has been one of the key states to extend support to emerging technologies at policy level. As part of their IT & Electronics policy launched in 2018, the state included the adoption of Blockchain technology which would be used to build a holistic system, develop skillsets and improve Government processes. It also announced the allocation of a 10-acre plot in New Town as a fintech hub. The State was one of the first States in the country to release Blockchain implementation guidelines with the release of West Bengal Blockchain Technology Promotion Guidelines in 2020.⁹



Telangana

Telangana has been one of the key states in releasing policy documents towards adopting the Blockchain technology. Telangana Government is also actively promoting the Blockchain technology and have a pool of successful use cases developed under Blockchain District initiative of Telangana State. The policy and blockchain district are based on four main pillars - Developing talent pool, supporting infrastructure, promoting research and innovation; and enabling collaboration and building community. The government intends to encourage technology institutions in Telangana to add blockchain in their curriculum. It also aims to vitalize its employees to undergo workshops launched in blockchain technology to facilitate better adoption within the government.

⁹ <https://digitalindia.gov.in/>

¹⁰ <https://www.startuphyderabad.com/>



Tamil Nadu

Tamil Nadu has also launched a policy in the adoption of Blockchain technology in the state. The key objective of the policy is to develop and mature the Blockchain ecosystem within the State. To this regard, the policy suggests spreading awareness about the technology. The Policy also encourages research and development in Blockchain technology by enabling academic and research institutions, start-ups and enterprises working on Blockchain technology through Blockchain forums and conferences.¹⁰



Maharashtra

Maharashtra also includes the adoption of blockchain technology in their IT policy. With the use of this technology, the state government has streamlined the process of the direct benefit transfer (DBT) to disburse benefits and subsidies to farmers and citizens. Under the Maharashtra Direct Benefit Transfer (MahaDBT), the finance department has distributed more than Rs.7000 Crore to more than 30 lakh beneficiaries.



Government of Tamil Nadu has launched Blockchain Backbone - a network that would enhance E-Governance in the State. This program will be reasonably adjusted with the goal that docs issued will electronically hit the Makkal Number made by Tamil Nadu e-Governance Agency (TNeGA).

Land Records (Dharani and CDAC) is a pilot program under the Blockchain District, launched by Government of Telangana, captures the full details of each property and provides the functionality of changing the ownership of the property. It also allows to search the property history and the validation of the vendor (seller) of the property.

Note: The above list is not exhaustive



Sh. Randhir Kumar, IAS

Managing Director, West Bengal Electronics Development Corporation (WEBEL)

EXPERT VIEW

West Bengal Electronics Development Corporation (WEBEL) has a rich legacy of nearly 50 years and has been at the forefront of technology adoption and implementation in the country. While Webel started by promoting the electronics industry in West Bengal and would manufacture TVs, however, with passage of time, it became a doyen in driving e-Governance and citizen service delivery not just in West Bengal, but across the country in other states as well.

West Bengal was one of the first State Governments in India to identify and realize the potential of new and cutting-edge technologies including AI, ML, Blockchain. It started its journey nearly five years back and achieved the distinction of being the first state in the country to integrate registration of birth and death certificates in blockchain. This project was launched as a pilot for NKDA in New Town area.

Providing a policy support for emerging technologies was another area of success in the State. The Information Technology and Electronics Policy 2018 of Government of West Bengal focuses on all emerging and futuristic technologies and has the mission to make West Bengal the hub of emerging technologies and thereby capture opportunities in new age technologies – 3D Printing, Analytics, Animation and Gaming, Artificial Intelligence, Augmented Reality and Virtual Reality, Blockchain, Cyber security / Cyber forensics, Data Sciences, Drones, Fintech, Intelligent Infrastructure, Internet of Things, Robotics, Industry 4.0, Embedded Technologies, Quantum Computing and Telecom Technologies (5G and beyond).

The State was one of the first States in the country to release Blockchain implementation guidelines with the release of West Bengal Blockchain Technology Promotion Guidelines in 2020.

Industry academia collaboration has also been the hallmark of the state in driving new age technologies and the State has collaborated with premier institutes in developing Center of Excellence in emerging technologies. The collaboration with ISI Kolkata was focused on Blockchain while the collaboration with IIIT Kalyani & IIT Kharagpur focused on AI.

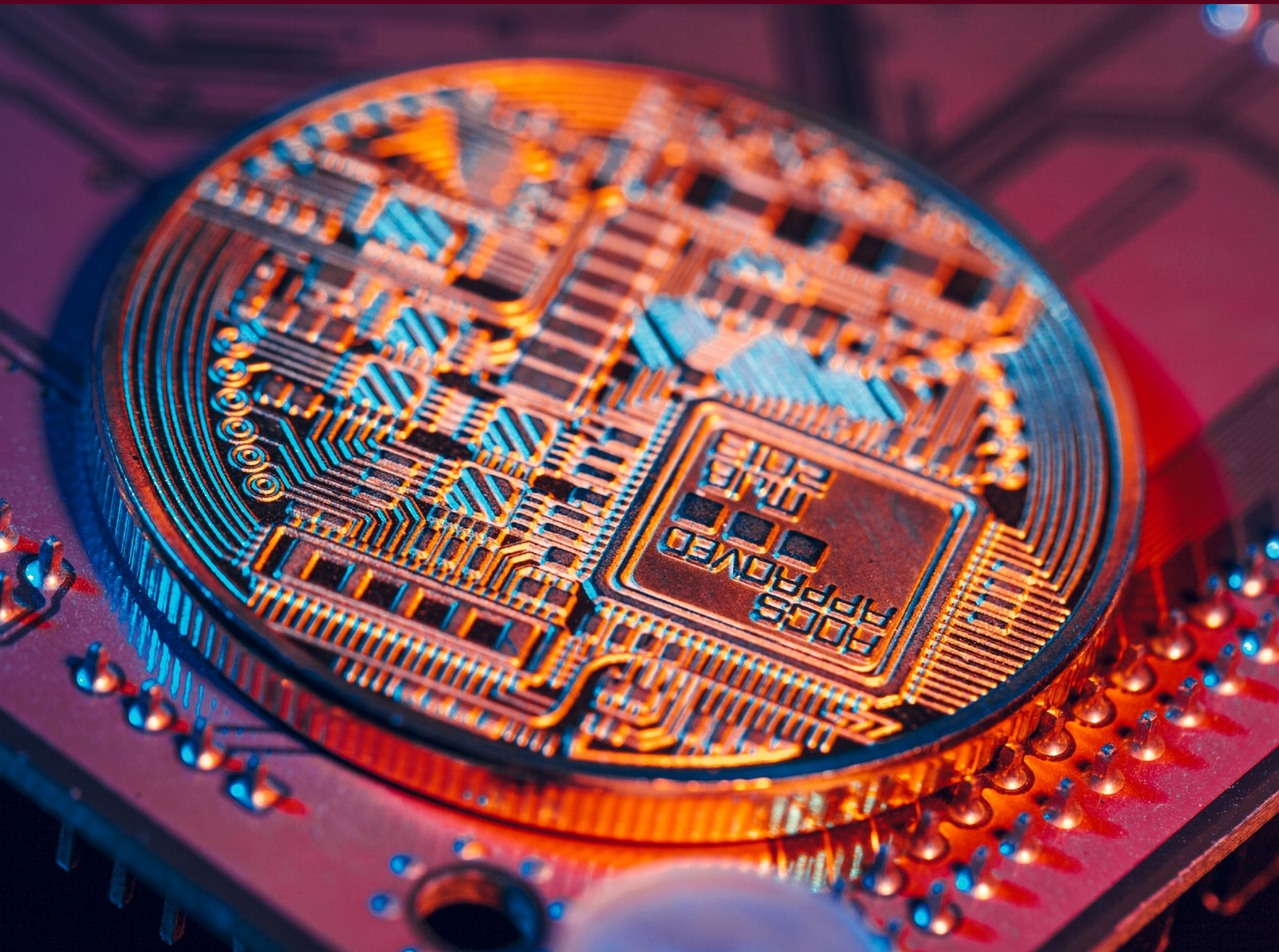
Webel also set up Centre of Excellence in Industry 4.0 along with industry partners to support MSMEs and other enterprises in their implementation on futuristic technologies. This also gives impetus to students and practitioners to learn more about new technologies and make the state a hub for the same.

Webel is now looking at further use of Blockchain, AI/ML, IOT and other new age technologies in enhanced citizen service delivery in the State in various areas such as issuance of certificates, land records, birth and death registrations. With strong mobile and internet penetration, advent of 5G, enabling policies formulated by the State and a digital first mindset of the State Government, emerging technologies hold a lot of potential in the days to come.

Our View

Policy support and adoption of futuristic technologies by Government can play a stellar role in its acceptance in India. Niti Aayog has taken a lead in driving the policy discussions in this space, and the same can be extended further to drive growth. Many State Governments have been proactive in this space too.

However, a clear mandate, drive and push would be needed, as is seen in many of the western countries, to fuel further growth in this space.



3 BFSI, Healthcare, Retail & e-Commerce and Manufacturing seen to be pioneers

BFSI, Healthcare, Retail, & Manufacturing are the major sectors which will see the maximum adoption of new age and futuristic technologies. Nearly 79% of the respondents felt that these sectors would have maximum usage of new age technologies.

The technological changes brought about by the pandemic have led to acceleration of various trends in our lives such as industrial automation and contactless payments, tele-health, virtual reality, remote working, and remote learning. Every industry from healthcare to manufacturing and IT to entertainment has been hit. Remote working paved way for the adoption of technology in our lives in unimaginable ways. Every aspect of business operations has been affected by tech adoption in one way or the other.

Socialising is now not restricted to brick-and-mortar structures, networking events are taking place virtually. Sophisticated technologies have been deployed to re-create virtual spaces for hosting international conferences bringing the world together in their computer screens. Patients are not zeroing in on OPD hours for medical consultations anymore, doctors are available virtually; students graduated online, and cases too were settled using technology.

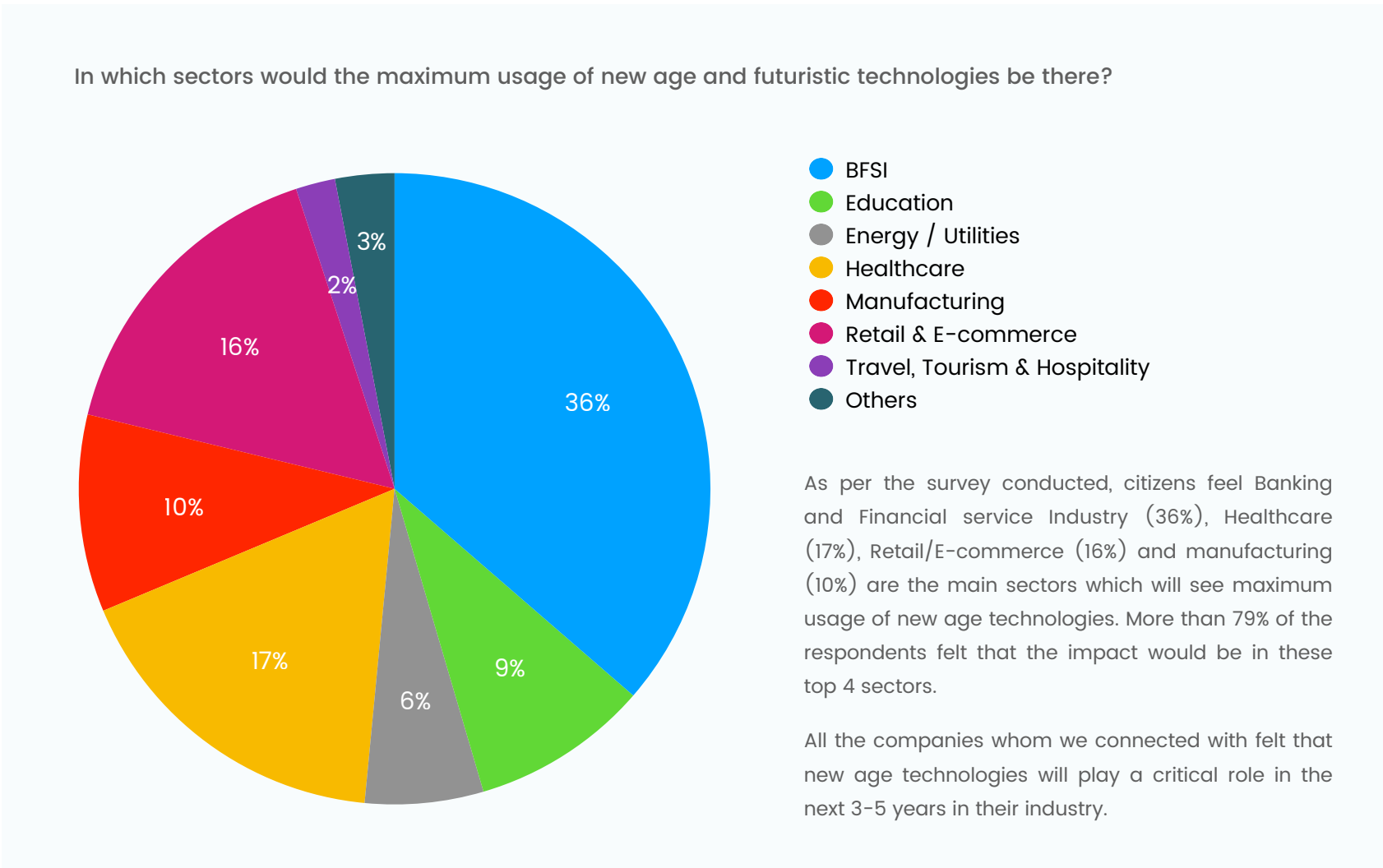






Fig 5: Major Sectors in Focus

A non-exhaustive list of potential impact of new age technologies in some of the sectors is given below:

Sector	Potential use	Present stories
BFSI 	<ul style="list-style-type: none"> Digital Currency FinTech services Fraud detection 	<ul style="list-style-type: none"> ★ India's indigenously developed Unified Payment Interface (UPI) is one of the most successful real time payment settlement systems, globally. In 2021, the UPI clocked transactions valued at 940 billion USD (39 billion transactions ¹¹). Players like PhonePe and GooglePay cater to more than 80% of UPI transactions ★ RBI is one of the first major central banks in the world to start a pilot project with its own virtual currency with the launch of the wholesale digital rupee on a trial basis, initially for settlement of transactions in government securities.
Healthcare 	<ul style="list-style-type: none"> Drone based delivery of medicines, vaccines Healthcare services based on smart wearables Telemedicine IOT driven connected devices used in healthcare services AI driven results for diagnostic tests 	<ul style="list-style-type: none"> ★ Recently, pilot test of a drone services network for medicines was done catering to remote towns in East Kameng district of Arunachal Pradesh. ★ Tata Medical Center and the Indian Institute of Technology recently launched India's first de-identified cancer image bank: the Comprehensive Archive of Imaging. AI-based tools can use high-quality de-identified images to enable machine learning models to detect biomarkers and improve outcomes for cancer research. ★ Amazon, Google, and Microsoft also joined a consortium called The Covid-19 High Performance Computing (HPC) Consortium to provide bioinformatics, epidemiology, and molecular biology researchers with computing power to execute computational research programs. The consortium provided researchers around the world with 600 petaflops of computing capacity, over 50k of graphics-processing units, and millions of chips and storage components.
Retail, eCommerce 	<ul style="list-style-type: none"> Demand forecasting Customized and personalized shopping experience Warehouse and logistics management 	<ul style="list-style-type: none"> ★ Pantaloons leverages AI-based personalisation solutions to offer tailored omnichannel experiences to customers. ★ Bata implemented an AI-powered video analytics solution to boost in-store sales, operations, and customer happiness
Manufacturing 	<ul style="list-style-type: none"> 3D Printing Robotics Data driven Predictive maintenance Intelligent self-optimizing machines 	<ul style="list-style-type: none"> ★ Implementation of Industry 4.0 across multiple factories ★ Numerous factories are using robots in painting lines, welding lines ★ Many Indian manufacturing companies are utilizing AI-enabled predictive maintenance systems for self-monitoring and reporting malfunctions in real time

¹¹ <https://www.deccanherald.com/>



INDUSTRY SNAPSHOT

Role of New Age and Futuristic Technologies in Aviation Industry

The advent of new age and futuristic technologies together with an increasing number of passengers and growing demand for personalization is putting the aviation industry under pressure over the last few years. The need for an early adoption of technology has become more significant with the industry being one of the worst-hit by the COVID-19 pandemic. Thus, the airports and airlines need to look ahead in the future to leverage technology to enhance passenger and employee experience.

Technology holds immense potential to help realize tangible benefits to airports and airlines. For instance, increasing use of biometrics and automation across multiple touchpoints can ensure contactless process and seamless passenger experience. Further, it protects secured zones such as runway control rooms; flags off any overcrowding incidents that enhances rescue operations during emergencies; detect abandoned bags; and achieve more with the given infrastructure at airports. Biometrics and contactless solution also include facilities and conveniences such as touchless check-ins, integrating contactless retail stores at airports, etc.

“An important competitive advantage for airports in today’s world is its degree of customer-centricity. Competition for passengers and airline routes is making airports rethink what they can do better to ensure better passenger experience, efficiency, and earnings. Development of a world-class digital experience platform not only encompasses a robust ecommerce website but also helps passengers undertake live interactions with airports to get real-time information such as gate change, flight delays, travel time at the airport, congestion at the gates, indoor navigation, etc.

The first step to digitalization in aviation industry starts off by understanding the key value streams and processes before leaping into its associated digitalization and technology. Technology such as big data and analytics are pivotal to multiple aspects that help understand the evolving requirements such as products and service offerings that passengers are on a lookout for. Deep understanding of passenger’s desire and focus on data collection at the airport ecosystem through digital processes and technologies are paramount for achieving a robust digital strategy that allows to process large numbers and enables tactical and effective decision-making.

Artificial Intelligence helps increase operational efficiency by predicting and mitigating flight delays, optimizing passenger flow. With Machine Learning, we strive to achieve net zero emission through proactive building management. Augmented Reality helps improve passenger experience by providing relevant information and services such as indoor navigation over smartphones.”



Mark Schwarz

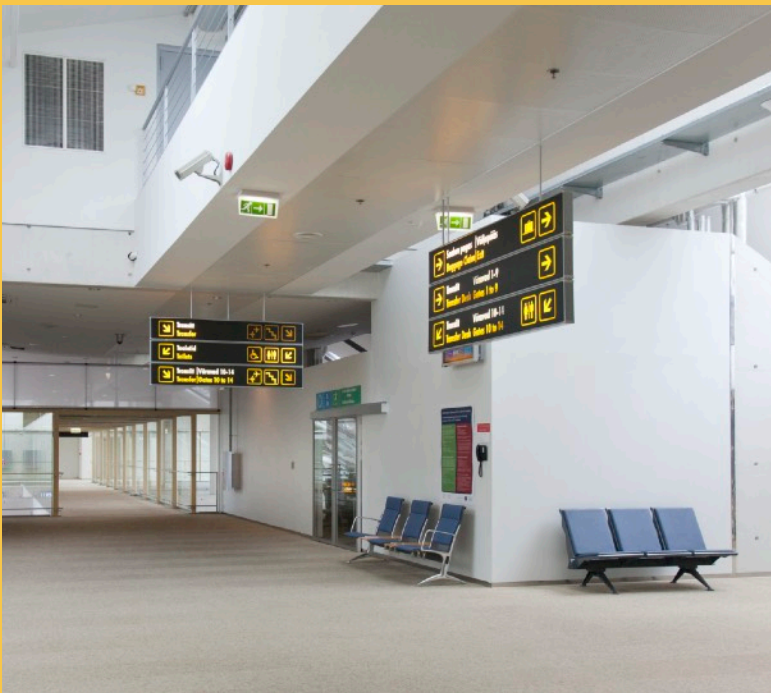
Head Digitalization and Business Excellence, Yamuna International Airport Private Limited

INDUSTRY SNAPSHOT

Role of New Age and Futuristic Technologies in Aviation Industry

Another critical technology is cloud-computing that helps airports become more agile and respond effectively during peak and lean periods. The cloud services function through a Software as a Service model, which helps switch between automation and full-service touchpoints with ease and this helps build in scalability, adaptability, and efficiencies at airports. Cloud technology helps provide off-site passenger services such as check-in and baggage drop services at locations such as train stations and hotels that are convenient to passengers, pre-order meals and faster path through security check, etc.

Cloud technology further helps airports and airlines reduce carbon emissions, which is becoming an increasing concern for the industry. Airports undertake operations on energy-intensive servers that consume large volumes of electricity, and airlines release massive volumes of fuel on runways. The Cloud helps airports centralize the servers, and airlines to optimize energy consumption on runways and thus, reduce emissions.



“Today's cars are more technologically advanced than aircrafts. This is attributed to the safety & certification protocols, dire need of proven and re-proven technology requirements in aircrafts. The risks are much higher when it comes to change in technology on civil aircrafts vis-a-vis other aspects in this sector. We are still a few years away before we see even simple technology such as access to the high-speed internet at an affordable cost and POS connection while commuters are on plane. There has been a significant advancement made in use of new age material in manufacturing aircraft parts which can significantly reduce weight, maintenance cost, increase life of components thereby increasing safety standards and make flying more affordable.

Having said that, there's definitely great potential in terms of technological advancement particularly the use of AI with respect to services rendered while in air and there's extensive research and testing being undertaken for the time being.”

Amrish Agarwal
Senior Aviation professional

Adoption of futuristic technology and digital transformation is critical for airports and will help them reap benefits that far exceed the investments made. At the same time, legislative and regulatory changes also have a substantial role to play in determining the speed at which technologies are introduced in this industry.



Dr. Alok Roy

Chairman and Managing Director,
Medica Synergie

EXPERT VIEW

Futuristic technologies to drive patient care

New age and futuristic technologies such as Artificial intelligence (AI), IOT and big data analytics will transform the Healthcare segment in India. It will help Healthcare service providers gain patient insights and improve patient care while reducing costs.

An AI driven system will be able to draw and analyse data from IoT solutions, electronic medical records, personal health devices and assist clinicians in tailoring personalized care and experiences for each patient. Data from IOT driven connected medical devices will also enable doctors to provide patient care even remotely.

At Medica, we have recently launched 'Virtual Consultation Clinic' in Agartala. The objective is to increase accessibility to quality healthcare and reaching a larger number of people in areas with need for specialist care. The Virtual Clinic shall connect patients in Agartala with senior consultants in the Kolkata Hospital, to enable them to seek advice and discuss treatment options.





Mr Akhil Handa
Chief Digital Officer,
Bank of Baroda

EXPERT VIEW

Digital Lending

India has seen tremendous success in digitizing financial services infrastructure, with payments being at the forefront. With the payment space well poised for this exponential growth, the end-to-end digital lending journey is the next focus area. The question which arises in our mind: “What is Digital Lending & how it will impact our future banking outreach”

Digital lending is the process of offering loans that are applied for, disbursed, and managed through digital channels in which lenders use digitized data to inform credit decisions and build intelligent customer engagement & database. It consists of lending **through web platforms or mobile apps**, by taking advantage of technology for authentication and credit assessment.

At the core of this digital lending boom is technology, playing a pivotal role in revolutionizing India's credit ecosystem by creating alternative lending channels that offer significant advantages to both lenders and borrowers. Lenders enjoy the benefits of low operational costs, improved risk assessment, access to new markets, revenue growth, better customer experiences, and increased customer loyalty. Borrowers can enjoy near-instant credit with reduced paperwork.

But the most significant benefit of digital lending is helping traditionally unserved and underserved customer segments access affordable credit.

Technology: A Game-Changer in Digital Lending

Technology can help overcome these challenges and level the playing field for micro-borrowers – individuals and MSMEs. Digital lending creates seamless customer on-boarding and credit disbursement processes with tech-enabled, mobile-friendly platforms that can replace physical interactions with remote loan applications.

With AI/ML models, big data analytics, lenders can study online behavioural patterns and other digital data of potential borrowers for a more comprehensive risk assessment. This helps lenders de-risk their loan portfolio and reduce NPAs. Even traditionally risk-averse lenders have either started building their own digital lending platforms or partnering with fintech players to roll out best-in-class services.

While embracing digitization, lenders must understand that digital lending isn't limited to just the credit application process. It involves digitizing the entire end-to-end process – from loan application, underwriting, disbursal, to repayment.

Various tech-enabled services help automate the processes, making it more secure and efficient such as Video KYC and e-Sign.

EXPERT VIEW

Digital Lending

Mature technologies like face match, liveness detection, and more help improve fraud detection and borrower authentication, making the digital KYC verification processes more robust. Optical character recognition (OCR) technology helps APIs scan and read identity documents like Aadhar, PAN card and extract data digitally, reducing the probability of human error and saving time. A continuous focus is required to enhance these technologies with improved models to increase accuracy and speed of processes. Additionally, judicious investments in emerging voice technologies like call centre automation can help lenders reap dividends later by ensuring greater customer satisfaction and retention.

eNACH (Electronic National Automated Clearing House), a system introduced by the NPCI, helps lenders automatically receive recurring payments from borrowers, faster and without requiring paperwork and manual interventions. This digitizes loan repayment processes and further reduces operational costs. New-age entities Digitap.ai leverage AI & ML technologies to provide these services and create a better lending infrastructure.

Geography is increasingly becoming less of a hindrance as borrowers can receive capital right at their fingertips, from the comforts of their homes without arduous paperwork, long waiting hours, and uncertainties.

Even though lending digitization is happening at an unprecedented pace, we've barely scratched the surface. Technologies like Blockchain, better AI/ML models, and cloud infrastructure can help FIs unlock unlimited possibilities. For example, lenders can harness blockchain's power to create a decentralized P2P lending ecosystem where they can interact directly with borrowers without needing an intermediary.

With technology adoption, incumbent FIs and Fintech players can create a truly future-ready lending model that empowers India's digital economy and promotes financial inclusion.

India's digital lending market has seen a significant rise over the years. The digital lending value increased from USD 33 billion in FY15 to USD 150 billion in FY20 and is expected to hit the USD 350-billion mark by FY23. It is estimated that the total retail loans which could be disbursed digitally in next 5 years could be over \$ 1 trillion.

Such a huge market for digital lending is next to impossible to avoid for any financial institution to grow and survive in future which is changing rapidly and digital adoption is more visible especially after COVID-19. An amusing message went viral as the pandemic set in: It is not the CEO or the CTO of a company but the COVID-19 pandemic that led to digital transformation. Is it true or not. Almost all industries and offices have gone digital. The most striking example is "Virtual Team Meeting" at our bank, which is most convenient, saving considerable time & cost, instant, spontaneous, and most easy way to connect and spread the message without any hiccups, but it was never imagined earlier before pandemic, the way, it is being used now.

Initially, digital lending was led by Fintech companies, but now traditional banks are started to engage their mind, heart and soul into the digital lending to make it one of the most promising part of their banking activity. There are few basic developments, which led to exponential growth in digital lending. First, consumer behaviour is changing rapidly due to exponential growth in internet penetration combined with smartphone availability. There is exponential growth in the digital transactions and a large section of internet users are not visiting branches to access the banking services.

EXPERT VIEW

Digital Lending

Second advanced big data analytics and advances algorithm enabling institutions to take an informed decision. A huge amount of data is getting generated through web search, social media, e-commerce, and banking. For enterprises, there are various data points such as data on various tax filings, GST returns data, various returns filed by corporates and individuals, legal records and companies/directors' details are electronically available.

This growth is further supported by favourable regulatory support and finally there is constant innovation by the lenders to suit their operative model for the purpose of digital lending. As part of Indian stack, the authorities have made a set of open APIs readily available to developers. This new digital architecture can make entire process less paperless & consent-based sharing of data possible across the country. With JAM & India stack, end-to-end digital lending is now a reality. India's credit bureau infrastructure is one of the best in the world. This is well documented fact, where India scores higher than some OECD countries on certain credit specific parameters such a depth of credit information index.

By setting up open architecture layers such as Aadhar, UPI, Bharat Bill Payment System and GST and rapid and exponential growth in payment ecosystem, Government is enabling all possible avenues for a rapid growth of digital infrastructure. To facilitate lending to MSME, the Government has set up Trade Receivables Electronic Discounting System. (TReDS), which will be fully integrated with GST network in securing an efficient digital lending for MSMEs. Another move is launch of Government e-Marketplace (GeM) as a central online portal for procurement of all goods and services required by Government Departments, PSUs & organizations.

In India, new models of doing business have emerged like Point-of-Sale transactions-based lending, bank-fintech partnership model, Invoice discounting exchanges, marketplace like paisa bazar etc.

Our bank is one of the early institutions to adopt digital lending. As part of the EASE 3.0 Public Sector Bank (PSB) Reforms Agenda, the Finance Ministry has unveiled the vision for tech-enabled banking and BOB has already initiated the process with full support of all the stake holders.

Bank of Baroda has unveiled Launch of Digital Lending Platform-Phase-1. Digital Lending Platform has enabled the prospective loan seekers to apply for loans through various channels viz. Bank's website, bob World etc. and receive sanction, disbursement through a Digital First mode.

In the 1st Phase of implementation of the platform, Bank enables the applicants to avail 'In Principle sanction' for their loan requirements of Home Loan, Car Loan and Personal Loan in a few clicks with minimal, mandatory documentation through a paperless process at the convenience of their place and time of choice. It is available to existing bank customers as well as to those customers who are new to the bank. The in-principle approval will be accorded within 30 minutes for Home Loan, Car Loan and Personal Loan.

Two new digital products, one of which is 'Pre-Approved Micro Personal Loan' has already been launched. This is at present available to existing customers of the bank and disbursement takes place in 0.50 minutes once entire stages is visited by the customers. The facility of 'Loan against FD' will also be launched shortly for the existing customers of the bank and it will be disbursed to the customer's account within 5 minutes of processing time.

EXPERT VIEW

Digital Lending

Bank of Baroda has entered into the 2nd phase of Digital Lending Platform- Phase-II & running a Pilot project through nominated Digital Lending Champions at ROs/ZOs to introduce complete digitization of Lending Procedures and experimenting with Digital Personal Loan, Digital Mudra Loan & Digital Renewal of MSME Loans & will start offering the complete digital experience after successful completion of Pilot Project.

Unauthorised digital lending platforms/mobile apps:

There have been reports about individuals/small businesses falling prey to growing number of unauthorised digital lending platforms/Mobile Apps on promises of getting loans in quick and hassle-free manner. These reports also refer to excessive rates of interest and additional hidden charges being demanded from borrowers; adoption of unacceptable and high-handed recovery methods; and misuse of agreements to access data on the mobile phones of the borrowers. RBI has cautioned Members of public not to fall prey to such unscrupulous activities and verify the antecedents of the company/ firm offering loans online or through mobile apps. Reserve Bank has also mandated that digital lending platforms which are used on behalf of Banks and NBFCs should disclose name of the Bank(s) or NBFC(s) upfront to the customers. The names and addresses of the NBFCs registered with the Reserve Bank can be accessed here and the portal for filing complaints against the entities regulated by the RBI can be accessed through <https://cms.rbi.org.in>.

RBI Working Group on Digital Lending:

Looking into the present and future challenges of Digital Lending, the Reserve Bank of India (RBI) in January 2021, has announced setting up of a working

group to evaluate digital lending, including online platforms and mobile apps. The newly formed committee will be suggesting specific regulatory measures pertaining to digital lending, and several other things. The RBI stated that “A balanced approach needs to be followed so that the regulatory framework supports innovation while ensuring data security, privacy, and confidentiality and consumer protection. Recent spurt and popularity of online lending platforms/ mobile lending apps (‘digital lending’) has raised certain serious concerns which have wider systemic implications,” the regulator said. The group has been directed to submit its report within three months.

Both internal and external members are part of the external group. The internal members are RBI executive director Sh. Jayant Kumar Dash, Chief General Manager (CGM)-in-charge of the department of supervision Sh. Ajay Kumar Choudhary, and CGMs Sh. P Vasudevan and Sh. Manoranjan Mishra. The external members are Sh. Vikram Mehta, co-founder of peer-to-peer (P2P) lending platform Monexo Fintech and Sh. Rahul Sasi, cybersecurity expert and founder of digital risk monitoring firm CloudSEK.

Further, the WG will be expected to recommend measures, if any, for expansion of specific regulatory or statutory perimeters and suggest the role of various regulatory and government agencies. It shall also recommend a fair practices code for digital lending players, insourced, or outsourced, and suggest measures for enhanced consumer protection. In addition, the recommendation of measures for robust data governance, data privacy and data security standards for deployment of digital lending services will come under the group’s purview.

EXPERT VIEW

Digital Lending

Digital, Financial Literacy:

With technology playing an increasingly important role in lending, the onus on lending entities will shift from digital literacy to financial literacy of customers. I also see a rising importance of transparency from lenders. The onus to educate the borrower on where the loan is originating from, the outstanding amount and the repayment date will always lie with the lenders. RBI's recent regulation on non-lending fintech platforms is a right step in this direction.

Digital lending is here to stay, but to ensure its success what is needed are stronger guard rails from both a legal and compliance perspective. Will CKYC grow to offer scale, or can two regulated entities share CKYC to ensure smoother customer onboarding? Will a digital loan agreement for a 50 lakh loan stand scrutiny in a court of law or will the legal establishment demand wet signatures and a physical loan agreement? While the infrastructure to answer these questions is present today, the key as always is change in policy and mindset that can fasten this transformation.



Mr Akhil Handa

Chief Digital Officer, Bank of Baroda

Our View

A popular saying goes, nobody can stop the idea whose time has come. Similarly, nobody can stop the expansion of digital platforms and new age technologies in the world today. The unabated penetration of technology in individual lives is a reality which cannot be restricted for long. Thus, this also gives rise to the natural fears of compromising on security. The importance of cyber security as a national security concern is thus being re-plugged the world over.

While futuristic technologies have immense benefits and are to be adopted, data privacy and cyber security also needs to be plugged into the design of such solutions itself.



4

India is poised to be the FinTech capital of the world

Fintech solutions have become extremely popular with nearly every respondent stating they had used one. More than 85% of the respondents have used Payment solutions, making it the most popular one.

Fintech may be defined as technology-based businesses that compete against, enable and/or collaborate with financial institutions. Fintech start-up firms engage in external partnerships with financial institutions, universities and research institutions, technology experts, government agencies, industry consultants and associations. Through these partnerships, they create a highly integrated ecosystem that brings with it the expertise, experience, technology, and facilities of all the entities together.

Growth and market success of any fintech hub originate from an integrated ecosystem. A successful fintech ecosystem is where all the market participants connect, engage, and share ideas across vibrant communities and networks, as well as identify and convert opportunities into business. In the current age of technology driven financial services, no market participant can afford to operate without it. ¹²

India's fintech market has gained a 14% share of the global funding resulting in becoming the world's second highest spot in terms of deal value, after gaining USD 29 billion in funding across 2,084 deals between January 2017 and July 2022, according to a report from Boston Consulting Group and Matrix Partners India.

In this sector, India witnessed a CAGR growth of 20% which US was at 16%, UK at 15% and China at 20%. India is currently the world's third largest fintech ecosystem with 7,460 companies in this sector, behind China with 8,870 companies and finally the US at the top with 22,290 fintech companies. ¹³ Innovation and technology have fundamentally changed the course of traditional financial services.

By 2026, the global Fintech market is anticipated to reach a value of around \$324 billion, expanding at a CAGR of roughly 23.41%. Numerous other nations, outside the US and the UK, are becoming powerful Fintech centres. **There are currently 187 unicorns in the fintech sector worldwide, 21 of which are located in India.**



¹² <https://indbiz.gov.in/>

¹³ <https://www.business-standard.com/>

Different Fintech Segments in India

In India, the most used fintech services include money transfer and payments, insurance, savings and investment, borrowings, and financial planning.

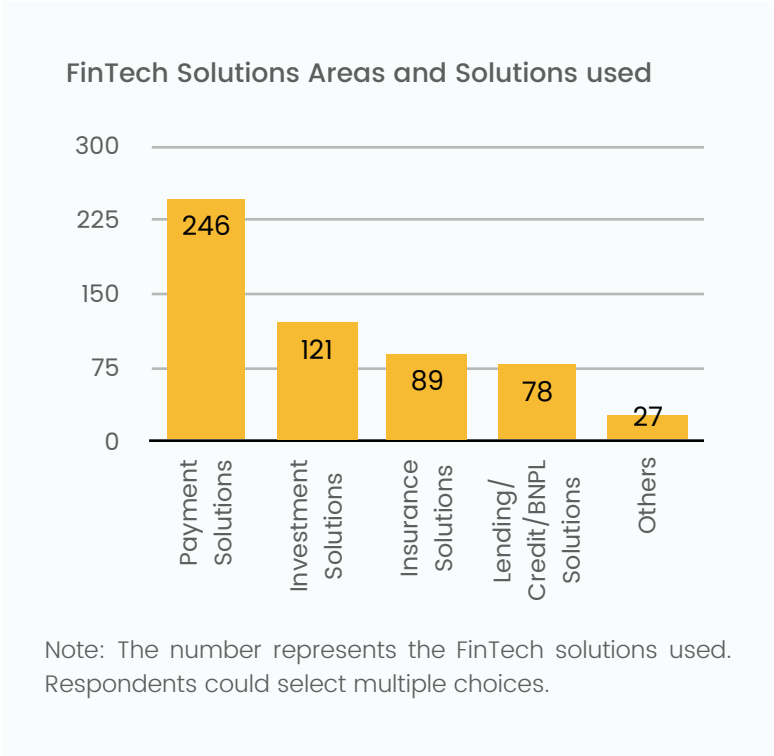




Fig 6: FinTech Solution Areas



Mobile Payments

Mobile payments are regulated modes of payment that take place digitally through one’s mobile device. Mobile payments include mobile wallets and mobile money transfers. Mobile wallets are the digital equivalent of the wallet one carries in their pocket. It stores credit or debit card details and cash balances which can be used to make payments. Mobile Payments use technologies like Near field Communication (NFC) for the transfer of money. It is expected that by 2025, digital payments collectively in India would account for more than 70% of overall payment volume, leaving cash and cheques at below 30%. ¹⁴



PhonePe – The PhonePe app is based on Unified Payments Interface (UPI) which facilitates merchants to accept payment through UPI, debit and credit cards as well as third party wallets. This company has received a total funding of USD 701 million to date.



¹⁴ <https://casereads.com/>



Insurance/Insurtech

Insurtech is a subset of FinTech. It includes anything and everything related to insurance, from car insurance to home insurance and data protection. This innovation is therefore helping people to buy, sell, and store policies online. Insurtech in action is available on Smartphone apps, wearables, claims processing tools, online policy handling, and automated processing, etc. Insurtech is also useful in collecting and analysing customer data hence enabling the provision of better and hassle-free services. **Companies such as Acko and Policybazar are leading insurtech firms in the country, revolutionizing this sector.**



Robo-Advising and Stock-Trading Apps

Robo-advising is a class of financial advising which takes place with minimal or no human intervention. It has disrupted the asset management sector by providing algorithm-based asset recommendations and portfolio management that have increased efficiency and lowered the costs. Additionally, by using stock trading apps, investors can buy and sell stocks at the tap of a finger on their mobile device. These apps are inexpensive and have made the experience seamless.



Budgeting Apps

Budgeting apps provide the convenience of having all the financial data in one place, which helps in easily monitor the spending of the user. Earlier, consumers had to create their budgets, gather checks, or navigate excel spreadsheets to keep track of their finances. These budgeting tools have revolutionized the way consumers think about their money.¹⁵

¹⁵ <https://casereads.com/>



Crowdfunding Platforms

Crowdfunding is a unique platform allows a large number of users to pool in their money and fund another entity or person in the platform, in small increments. This is an easier way for companies to raise funds for their projects. Each platform focuses on a different section of the market which include equity, debt, and reward-based crowdfunding. Charity crowdfunding is the largest segment of Crowdfunding in India.



Ketto – Ketto is Mumbai-based crowdfunding platform and has a variety of campaigns to choose from. These include campaigns for healthcare, education, sports, animal welfare etc.



TheHotStart – TheHotStart has helped Indian entrepreneurs with various projects, including medical care, education and food and beverage and charges a part of the funds raised.





Mr Dharmender Jhamb

Vice President,
Paytm

EXPERT VIEW

Driving Financial Inclusion through Futuristic Technologies and Innovation: Through the lens of Paytm

Paytm is India's leading mobile payments and financial services company and has always been at the forefront of the digital revolution in India. As a pioneer of mobile payments and QR technology, Paytm has successfully developed several innovative and futuristic financial products and services that touch the lives of millions of small businesses and merchants across India as well as ordinary citizens. The company has brought to life India's first payments Super App – the Paytm app, that satiates the financial needs of every consumer and merchant.

To understand where we are today, it would be worthwhile to highlight some of the key technological innovations that Paytm pioneered in the financial services industry.

1. Making mobile payments simple:

There was a time when we couldn't think of stepping out of our houses, without carrying a physical wallet with us. However, a wave of change has been brought in by mobile payments pioneer Paytm, which showed India how with just the smartphone, we can go cashless. Paytm brought the Paytm Wallet, which soon became the go-to payment method for Indians. It was the first step towards imagining a cashless India. Today, the Paytm Wallet continues to be a leading payment method for millions of Indians.

2. The revolutionary QR code:

Quick response (QR) codes have become a common payment option for Indian smartphone users at restaurants, grocery shops and the like, and it was Paytm who pioneered the method and today leads the field. Paytm became the first Indian company to successfully integrate QR codes into its payments platform paving the way for small businesses to accept digital payments without having to buy an expensive POS machine. Today, the company has further gone ahead and brought its own payment instruments that enables Indians with the flexibility to transact with Paytm Wallet, Paytm UPI, Paytm Postpaid (Buy Now, Pay Later), netbanking through Paytm Payments Bank and much more.

EXPERT VIEW

Driving Financial Inclusion through Futuristic Technologies and Innovation

3. Breaking all barriers with the IoT-enabled SoundBox:

The adoption of digital payments in India has skyrocketed over the past few years, and the country is now one of the leading markets in the segment, driven by rapid adoption of online payments. Being the leading digital payments and financial services company in the country, Paytm was the first company to empower merchants with a unique Internet-of-Things (IoT) enabled multi-lingual device called the Soundbox. Introduced in 2019, this innovative solution today has gained country-wise acceptance, enabling merchants across India to receive payment notifications in their own regional language.

It supports multiple languages such as English, Hindi, Tamil, Telugu, Kannada, Marathi, Malayalam, Bengali, Gujarati, Punjabi and Odia. By providing instant audio alerts on receiving digital payments in merchants' preferred language, it helps prevent frauds as now a fraudster cannot trick a merchant by showing a fake payment receipt in an App.

It works with multiple payment methods such as Paytm Wallet, Paytm Postpaid, Paytm UPI and other BHIM UPI apps, net banking and cards, therefore providing more flexibility and convenience to our merchants.

With over **5 billion online payment transactions processed through Paytm's Soundbox devices in FY22**, this innovative offering continues to be the leading payment reconciliation solution in the country. In addition to enabling merchants with seamless payments, Paytm's Soundbox devices have helped save paper slips, thus being environment friendly.

4. Fraud prevention through Intelligent Analytics:

The need to prevent online frauds and protect the interest of end users cannot be overstated. The rapid growth of Fintech platforms has also attracted the attention of fraudsters who have devised inventive and innovative ways to defraud the system and make easy money. Frauds involving real-time payments are on the rise, according to the report, as fraudsters increasingly target new channels.

Recognizing the need to have an intelligent and near real-time platform for detection and prevention of frauds, Paytm has developed an AI-driven analytics platform for in-house detection and prevention of frauds. The indigenously developed platform is a confluence of various quantitative sciences, such as Business Intelligence (BI), data mining, Machine Learning (ML), and Artificial Intelligence (AI). The platform enables constant risk monitoring as opposed to traditional risk profiling technologies which are extremely laborious and slow. The system enables the fraud team to automate the scan and search of all available transactions to spot red flags. It also enables Paytm to merge, normalize, and compare data from different systems and sources with very little effort.

It is expected that the above platform would prove to be a potent tool for prevention of financial fraud.

Paytm pioneered mobile payments in India, serving customers as well as small and large merchants. The company's technology platform is focused on delivering newer ways for payment solutions, including GPS based payment etc, with constant focus on innovation. It is this razorsharp focus that has brought innovative technology and the ultimate business solution that has become mainstream for the industry and the country.

Mr Dharmender Jhamb

Vice President, Paytm



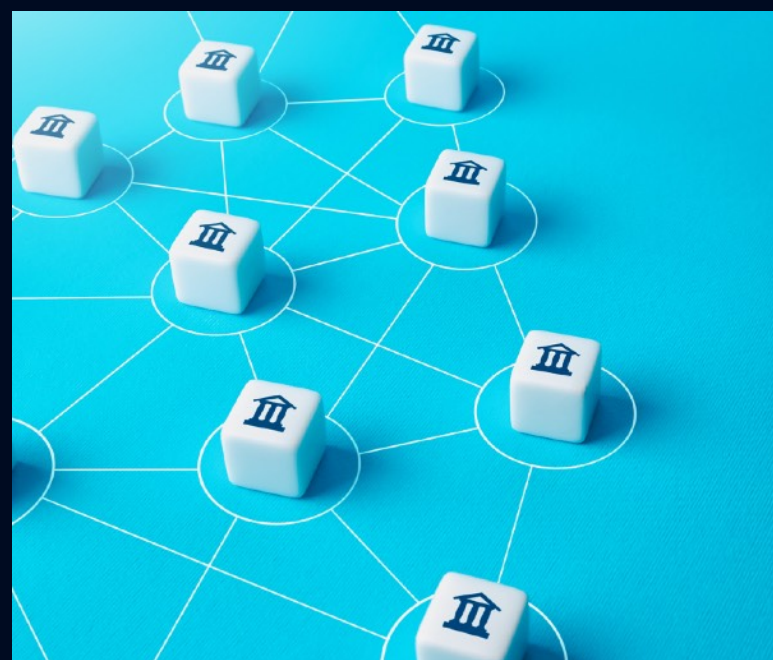
Mr Vaibhav Joshi
Co-Founder and CEO,
Easy Pay

EXPERT VIEW

Fintechs are driving service delivery and upliftment of the MSME segment using futuristic technologies

The Indian MSME sector is a key driver of the nation's economic growth, as it contributes to nearly 30% of our GDP and is the second largest employer, providing over 11 crore jobs to the domestic workforce. However, the sector continues to face many legacy challenges in terms of poor infrastructure, regulatory issues, and lack of financial support. Considering their unique credit needs and the fact that nearly 90% of MSME units in India are still outside the formal credit system, only the Fintech sector has the capability to uplift the sector by providing timely credit access, within the regulatory framework. This boost to the MSME sector will also help India achieve its dream of a \$ 5Trillion economy.

The resurgence of the MSME sector needs a pragmatic approach with a longer vision and fintechs play a critical role in their upliftment. The digitally transforming India is witnessing many entrepreneurial ventures from the non-metro markets, or what we call the real Bharat, that accounts today for over 1150M and \$1T GDP. Many of these businesses are in areas with no access to banks, ATMs or phone-banking facility and thus digital adoption of business (80-90% of MSME owner are smartphones users) with the support of the fintech players, is the only way to sustain growth.



Fintech players are also smartly using new-age technologies and futuristic products to augment their services. In this digital era, technology like Artificial Intelligence (AI) and Machine Learning (ML) have become useful tools for Fintechs to help in authentication, fraud detection, real-time sourcing of consumer data, forecasting customer needs and automation of manual work which improves efficiency, security, and accuracy of the system. Credit assessment is another crucial area where AI, big data analytics and ML is helping fintechs to reduce delinquencies. Easy Pay is leveraging these technologies in developing their own Credit AI engine, which helps them to evaluate customers' creditworthiness, intent, and ability to repay, thus reducing the risk of delinquency which makes EP the favourite partner for NBFCs and Banks. In addition to timely credit access, Easy Pay is also leveraging modern tech to build an app, as a one stop solution for all the financial needs of the MSMEs, be it business or personal and that can support MSMEs at every stage of their growth journey.

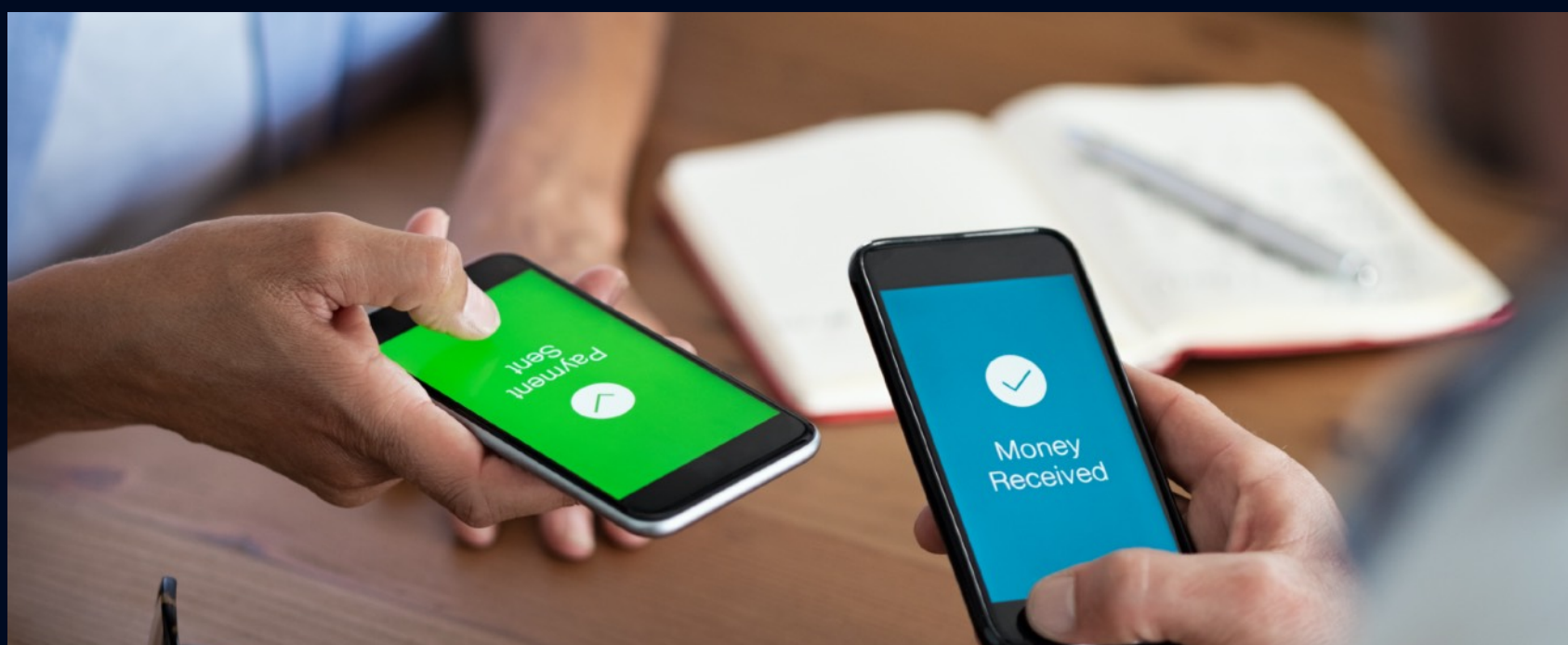
EXPERT VIEW

Fintechs are driving service delivery and upliftment of the MSME segment using futuristic technologies

Another emerging technology is, Embedded Finance through which even non-financial entities can integrate financial services into their system via API. This makes it easier of MSMEs / entrepreneurs to manage their financial dealings for business and personal use. Easy Pay is the fastest growing embedded finance platform for MSMEs in India. But when we speak of digital transactions, MSMEs have a pertinent fear of financial fraud or lapse in security measures leading to data piracy or theft. Fintechs are deploying technology for providing real time self-service and assisted services – like Chat Bots and virtual relationship manager, to provide update on ongoing processes and monitor the system to resolve potential complaints raised by any party. The main reason why Fintechs can seamlessly monitor the entire transaction cycle from demand to delivery – is because of its 100% digital format. Even if there was one point of manual intervention, the speed and accuracy of service by Fintechs would be hampered rendering it ineffective in comparison to traditional financial institutions.

Fintechs are harnessing new realms of technology to strengthen the security aspect of the app, without compromising on the ease and convenience of the user experience. Futuristic technology like blockchain, hybrid security features, multisensory detection etc. are being integrated into the Fintech tech-mainframe to enhance data confidentiality and customer protection. Technology applications like RegTech and SupTech, help improve efficiency using automation, introducing new capabilities and streamlining workflows, withing the regulatory framework.

The emergence of new-age technologies is pivotal for the overall growth of the Fintech sector. However, tech-development needs to be aided with consumer digital literacy, policy reforms and better infrastructure, which will together boost the MSME sector and help our economic growth and position India as a global hub for the fintech sector.



Mr Vaibhav Joshi

Co-Founder and CEO, Easy Pay

Our View

The fintech industry is expected to revolutionize the financial sector in the coming times. The e-commerce market will also be greatly enhanced by increasing use of payment gateways, offering credits, carrying out commercial and personal transactions globally, and making account setups simpler.

India is amongst the fastest growing Fintech markets in the world and currently there are 6,636 Fintech start-ups in India. Another critical aspect of fintech that needs to be highlighted is its adaptability. It has been found that young people and metropolitan places have high levels of adaptability. Fintech has had a significant influence in a relatively short amount of time, but it still has a long way to go.

The growth of fintech industry in India is further dependent on how new technologies are developed to provide new tools to handle their finances and how existing system is available to a large number of people. All of these indicators show that this industry has enormous development potential, especially if fintech works with established organisations like banks, insurance firms, and the retail sector to increase its influence and radically change the Indian banking and financial industries.



5 Big data and Analytics to drive decision making across industries

The use of futuristic technologies like AI, IOT would lead to a large quantum of data, which can be used for analytics driven decision making.

Big Data is using cutting-edge analytical methods on very large, diversified big data sets that comprise structured, semi-structured, and unstructured data from many sources and range in size from terabytes to zettabytes. Analytics focuses on the business implications of data and the insights generated from it are being used for informed decision-making and actions as a result.

The use of big data and analytics together in harmony enables the industry with high-value impactful insights which are then used to drive the businesses and support in taking informed decisions about the futuristic opportunities at hand with clear forecasts and data-driven reports to support the decisions.

Futuristic technologies like AI, ML, IOT, Blockchain to further enhance need for big data driven analytics

Internet of Things (IoT), mobile devices, social media, and artificial intelligence (AI) are driving sources of data to become more complicated than those for traditional data, and the use of analytics to understand their trends, generate insights, and drive actions based on them. The problem-solving and predictive capabilities of analytics are supporting industries to handle challenges such as accurately forecasting demand, protecting business needs, and identifying potential supply chain disruptions.

Patterns, outliers, and correlations may be found in Big Data considerably more quickly and accurately thanks to AI and machine learning techniques. Through the cloud, they may access more data from more sources, such as social media and sensors from the Internet of Things, and uncover insights, opportunities, and threats that would otherwise go unnoticed.

Blockchain helps in the verification and traceability of multiple steps of transactions requiring verification and traceability at all steps. With blockchain, transactions can be secured, compliance costs are reduced, and data transfer is faster with transfer processing. Blockchain is the backbone supporting the growth of Web 3.0 and cryptocurrency. Blockchain is considered to be the major disrupter for major industries such as Banking, Cyber Security, Healthcare, Supply chain management, and Government.

The Analytics market is seeing a significant growth and is driven by demand from BFSI, e-Commerce, Pharma and Healthcare, Engineering & Manufacturing. ¹⁶ All of these segments would be tremendously benefited through adoption of new age technologies, thus leading to greater quantum of meaningful data which can provide actionable insights.

¹⁶ Source: Analytics India Magazine – Analytics India Industry Study 2022

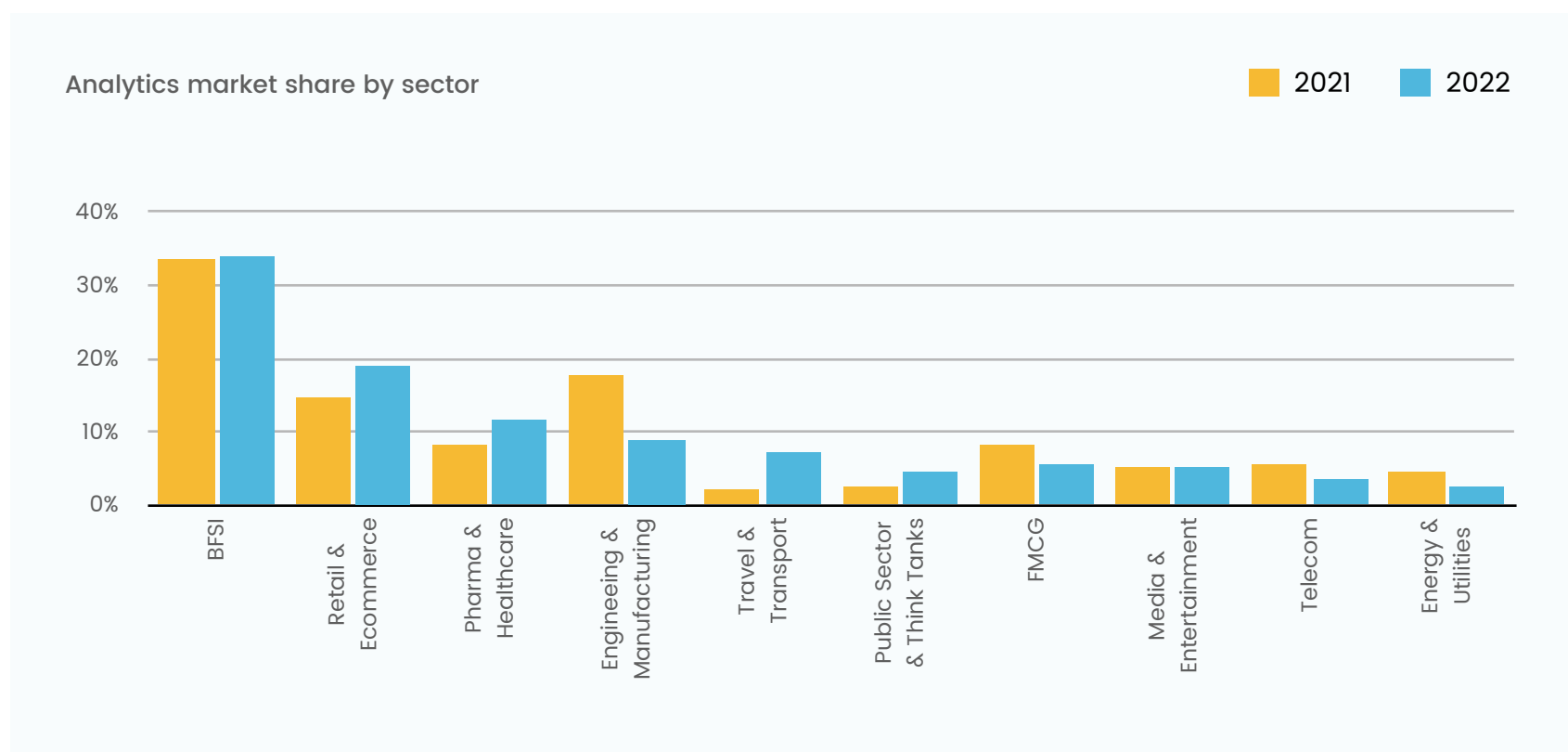


Fig 7: Sector wise Analytics Market share

Some prominent areas of synergy include:

1. Big Data in e-Commerce:

Big Data analytics in retail enables the providers to categorize the consumers into multiple personas and leverage user behaviour such as past order history, search history, spending behaviour, average ticket size, etc. to optimize pricing strategies leading to a wider catalogue of options made available to consumers. Machine learning algorithms play an important role in defining these personas and training themselves based on the data generated by the consumers.

2. Ayushman Bharat Digital Mission (ABDM):

ABDM has been formulated by Ministry of Health and Family Welfare (MoHFW), Government of India, with an aim to boost the digital health infrastructure of India. The mission aims to build a seamless online platform with a wide range of information data and infrastructure services available by leveraging open, interoperable, standards-based digital systems while securing the confidentiality and privacy of personal health-related information of people. ABDM aims to leverage big data to create a nationwide repository of healthcare facilities, healthcare providers and patient data to facilitate clinical research in fields like Genome Sequencing, surveillance and monitoring for health emergency preparedness and mitigation.

3. Use of big data in fraud detection in BFSI:

Big data enables BFSI institutions to study and understand patterns in data, thus detecting potential frauds, reducing chances of frauds and questionable transactions. This makes the overall BFSI segment much safer for customers to deal with.

4. Use of big data analytics in manufacturing:

The Internet of Things (IoT) devices used in manufacturing is able to capture vast amount of information about the functioning and performance of machines. Big Data makes the analysis of vast amounts of such information possible, helping to recognize patterns and thus predicting chances of machine failures or need for preventive maintenance. This makes it easier to fix the problem and reduce operational expenses.



Potential Challenges

While big data and analytics opens up limitless opportunities, there are challenges as well. Some of them include:

1. Data volume growth issues:



One of the most challenging tasks of Big data is storing all these huge sets of data properly. The amount of data being stored in data centers and databases is growing exponentially with time and getting extremely difficult to manage. Most of the data is generated out of documents, videos, audio, and text files and is unstructured in nature, which makes it difficult to find easily in databases. Industry to come up with innovative solutions for efficient data storage frameworks and adopt compression and deduplication at large scales to reduce unwanted and duplicate data.

2. Data Security:



Security of the huge datasets is still a daunting challenge, and most industries push data security for a later stage focusing more on understanding, storing, and analyzing data which makes them prone to malicious cyber-attacks. Many cyber security frameworks are in place however their implementation is still a challenge due to costs and policies around it.

3. Data Privacy:



Data privacy is another concern that needs to be addressed considering the huge quantum of personal data that would get generated through the use of connected and integrated devices and futuristic technologies.

While challenges exist, the benefits of using Big data analytics far outweigh the same. Therefore, the future would be of organizations which can harness the potential of data and use it to provide better services and facilities to its clients and customers.





Mr Manish Nair

Head-Alliances & Channels, India/Emerging Markets,
SAS

EXPERT VIEW

How Big Data and Analytics are driving decision-making across industries?

Data is the cornerstone of providing competitive advantage to business and turnaround in difficult economic times and market conditions. As the world grows digitally, mammoth amount of data is generated, exchanged and managed & it continues to rise. Big data and Artificial intelligence (AI) help organizations to analyse & derive intelligence with this vast amount of data quickly to drive greater value for business, consumers and Governments. Big data is defined by 5 V's which are as below:

- **Volume:** It refers to the size of the big data which is rapidly increasing due to cloud computing, social media, IOT, etc.
- **Velocity:** It refers to the speed at which data is getting generated. Example would be social media site like Facebook post's, twitter messages, etc
- **Variety:** It refers to structured, semi-structured and unstructured data which is generated through different sources either by human or machine.
- **Veracity:** It refers to the quality of the data being analysed. Data collected from diverse sources need to be checked for accuracy before using it for business insights.
- **Value:** It refers to driving business value with data to drive decision making thus providing business benefits. Big data which is high volume, high velocity, high variety & high veracity need to be processed through advanced analytics tool to reveal meaningful information.



EXPERT VIEW

Driving Financial Inclusion through Futuristic Technologies and Innovation

With this we can easily infer, big data is the fuel and analytics is the engine which drives innovation & growth for organizations who are looking at competitive differentiation in the market. Across industries, we see big data analytics helping organizations unlock immense potential, some of the representative industry use cases are as below:

Banking:

Customer's today are expecting high levels of customer services & are spoilt for choices, this provides challenge to organization to cater to customer need and also in turn provides opportunities to provide differentiated services to wow the customer. Big data analytics can arm banks/financial institutions with capability to understand & process customer data using both personal and transaction data to create a 360-degree view to:

- ✓ Identify opportunities to upsell and cross sell products/services.
- ✓ Streamlined customer feedback to stay up to date on customer concerns and respond in timely manner.
- ✓ Enhanced capability on fraud detection.
- ✓ Increased customer retention.

Government:

Big data analytics provides immense benefits to public sector which have direct impact on the lives of the citizen & ability to govern efficiently. Some of the areas where advanced analytics can help government organizations are as below:

- ✓ **Eliminate fraud, removing waste and abuse**
Tax agencies leverage advance analytical capabilities to profile people who could be tax evaders & identify potential fraud. With big data analytics, Healthcare agencies can better manage government subsidies by knowing where the money is going and benefiting the eligible citizens.
- ✓ **Reduced crimes and security threats**
Big data analytics can help in uncovering crime patterns and illegal activities that pose specific threat to the citizens.
- ✓ **Smart energy management**
By applying big data analytics technology like forecasting and predictive asset management, Government utilities can efficiently and accurately make decisions regarding power planning & generation & proactive maintenance of assets.



Mr Manish Nair

Head-Alliances & Channels, India/Emerging Markets, SAS

Our View

Use of big data analytics arising from adoption of AI, IOT etc. is here is stay, and is the future. To facilitate the same, the following needs to be considered:

1. Personal data revolution has progressed at a very fast pace driven by a rapid evolution of big data and AI technologies; the larger society has not yet maintained similar pace in terms of developing an ethical framework to govern the options in the data value chain. It becomes an urgent need for society to **evolve a consensus on the framework that can guide the organizations at large on the ethics of the data.**
2. **An ideal future to drive the larger agenda on privacy in India will require foundations to be built around five principles –**
 - Strong ownership of individual's personal data
 - Consent of individuals
 - Accountability
 - Transparency
 - Fair compensation in exchange for use of personal data
3. **Augmented insights from Augmented Reality –**
This has been used extensively with gamification techniques and many solutions around fully immersive virtual reality environments. One of the best examples is the introduction of the metaverse. It has been debated to have very high growth potential with many firms eyeing their positions. It will come with huge data of user interactions which hold the potential to provide a personalized and interactive experience, increasing the user retention rates.



6

Web 3.0 is expected to be a gamechanger in India



Web 3.0 is a vision for the next phase of internet development that proposes a decentralised blockchain-based environment. Web 3.0 also makes use of machine learning, artificial intelligence (AI), Virtual Digital Assets, and the Metaverse to facilitate the development of smarter and more adaptable applications. Since its beginnings, the internet has evolved by orders of magnitude, from the simple, read-only web pages of Web1 to the highly interactive and social Web2 of today. The rise of Web 2.0 was primarily supported by three innovative layers: mobile, social, and cloud while **Edge computing, decentralised data networks, and artificial intelligence will comprise Web 3.0.**

India has witnessed a rapid growth in the Web3 ecosystem with over 450 active start-ups and a fast-growing talent base of over 75,000 industry participants have already raised a funding of about \$1.3 billion till April 2022.¹⁷ India's demand-supply gap is the smallest compared to the United States, China, and the United Kingdom as a result of the country's exploding Web3 growth, which is supported by an expanding skill pool.

In addition, the country is home to more than 11 percent of the world's Web3 talent, making it the third largest Web3 talent pool in the world. India ranks top in reskilling in newer technologies, which is regarded as essential for upcoming technologies such as Web3 and blockchain.¹⁸

As India's digital economy increases to \$1 trillion over the next few years, it is possible that 10-20% of this value will be owned by Indian consumers.¹⁹ The average Indian consumer spends more than seven hours each day on their smartphone, which is about half of their waking time. This time has significant value, so much so that every month in India, new Unicorns emerge as entrepreneurs develop services to capitalise on the value of this time spent online.

¹⁷ <https://www.businesstoday.in>

¹⁸ <https://cointelegraph.com>

¹⁹ <https://pib.gov.in>

This is made feasible for the first time in human history by blockchain technology. Blockchain enables users to own the value of their digitally spent time, so possibly releasing brand-new economic prospects for themselves and the nation.

If customers could own a portion of the platforms they helped establish, they would be able to share in the economic benefits as the platforms' value increases. Possession is a tool for accumulating value. This tool is currently utilised extensively in the real world. With blockchain technology and VDA, this instrument is now also accessible in the digital realm.

Web3-based solutions offer enhanced control over digital assets while ensuring cyber privacy. It delivers not only greater credibility and transparency, but also digital asset ownership to entrepreneurs, investors, and customers holding Virtual Digital Assets (VDAs). **India is currently the world's second-largest market for VDAs.**

DeFi is a peer-to-peer financial platform that operates on the blockchain. With the advent of VDAs, the notion has gained significance as it enables one to take out a loan against their VDA without an intermediary. Here, the lender and borrower meet on a DeFi lending platform, where the borrower gives the lender the asset as collateral to borrow money, and the lender makes interest revenue in exchange.

Social security certificates, birth dates, and other personal information documents can be stored on a decentralised blockchain ledger, allowing for a global identification proof comparable to the current Aadhaar.

Blockchain can increase liquidity by automating property administration and creating immutable land records and property rights. The immutability

of the information maintained in a blockchain is of great benefit to the government, which may permanently record transactions involving property, land, stocks, and everything else. The permanence of transaction storage has presented digital artists with a one-of-a-kind opportunity, and their livelihoods are changing due to the large sales of their NFTs to a new Web3-savvy audience. NFTs are coded on a blockchain, and they are used to guarantee asset ownership. **The use of NFTs to enforce digital copyright and trademark law has potential. Since November 2017, \$174 million has been spent on NFTs.** ²⁰

Metaverse, a central component of Web3, is a digitally native environment where individuals would spend their time working, socialising, and engaging in a variety of activities. It includes virtual reality (VR), augmented reality (AR), mixed reality (MR), gaming, VDAs, social media, among others. Web3 offers decentralised protocols and a technological stack that can be utilised to construct portions of a metaverse and the new communities and economy it will enable. Digital collectibles spanning art, athletics, gaming, and entertainment were made available to consumers. The collectibles are held on Polygon, a layer-II blockchain.

Web3 is powering the next generation of gaming platforms, which will enable users to earn money while playing favourite games from any part of the world by possessing in-game tokens that can be exchanged or sold on the blockchain. These new platforms, such as play-to-earn games, in which players become both the product and the economy, as opposed to simply the economies that sustain these gaming firms. Players will be able to vote on proposals, purchase NFTs, and earn prizes through staking and gameplay on Hike's Rush Gaming Universe, the first mobile-only blockchain gaming platform to emerge from India.

²⁰ <https://www.forbes.com>

In July 2021, Polygon formed the Polygon Studios branch with an aim to transform gaming from Web2 to Web3. The Polygon network would make it easier for developers and gamers to create and play blockchain-based games. Some of the largest Web3 projects, including the world's largest NFT marketplace, OpenSea, and the most popular metaverse, Decentraland, operate on the homegrown firm.

Things have changed rapidly and profoundly in the previous several years. With internet connectivity and increased mobile phone usage ushering in the information age, even the final mile of rural India is exposed or capable of being exposed to the benefits of technological advancement. It is becoming increasingly evident that the next wave of wealth and value creation will emanate from a fully programmable financial sector. If this opportunity is embraced, India may be at the forefront of this next wave and expand its economy to increase its place on the global stage.

To realise this vision, Industry leaders across Web3 verticals have collaborated to form the Bharat Web3 Association (BWA), to enable and support the growth of India's Web3 ecosystem. Members of the BWA span multiple verticals including NFTs, Web3 Gaming, Infrastructure Providers, Virtual Digital Assets (VDAs), and Token Projects. The BWA will serve as a platform to bring together different stakeholders – academia, investors, companies, educational institutes, government, and regulators and focus on –

- driving awareness through research to help keep pace with this evolving technology;
- promoting dialogue between key stakeholders;
- setting standardised principles in the Web3 industry;
- encouraging and promoting Web3 and blockchain innovation;
- nurturing India's talent pool.



Highlighting the importance of Web3 and the critical role that the BWA will play, **Sumit Gupta, CEO & Co-Founder, CoinDCX** said, "Web3 is a revolutionary technology with immense potential to create new jobs and opportunities and encourage financial inclusion. Web3 is expected to add \$1 trillion to India's economy by 2032. It can completely upgrade the way we use the internet. India has almost everything it takes to lead this revolution – the manpower, the talent and most importantly the passion to become a global web3 leader. The Bharat Web3 association will be a vital building block to nurture innovations and build a strong ecosystem enabling the Blockchain/ Web3 industry to contribute to the Indian economy and making India truly Atmanirbhar."

This initiative can help India determine what it wants from emerging technologies as a nation and contribute to global policy discussions. India may become a prominent leader in the Web3 economy with coordinated efforts. India possesses talent, but it must now bring policy and regulatory clarity to the forefront. India's quick adoption of new-age technologies, its expanding start-up ecosystem, and its enormous pool of digital savvy talent forms the perfect foundation for India to emerge as a prominent player in Web3.



Mr Kavin Bharti Mittal

Founder & CEO,
Hike

EXPERT VIEW

Role of Web3 in revolutionising the Indian economy

Indian consumer spends an average of 7+ hours per day on their smartphones, almost half their waking lives. The blockchain finally enables consumers to own the value associated with their time spent digitally thus potentially unlocking brand new economic opportunities for themselves. It's becoming increasingly clear that the next wave of wealth and value creation will come from a financial world that is programmable end to end. India could be at the centre of this next wave and boost its economy to strengthen its position on the world stage.



Our View

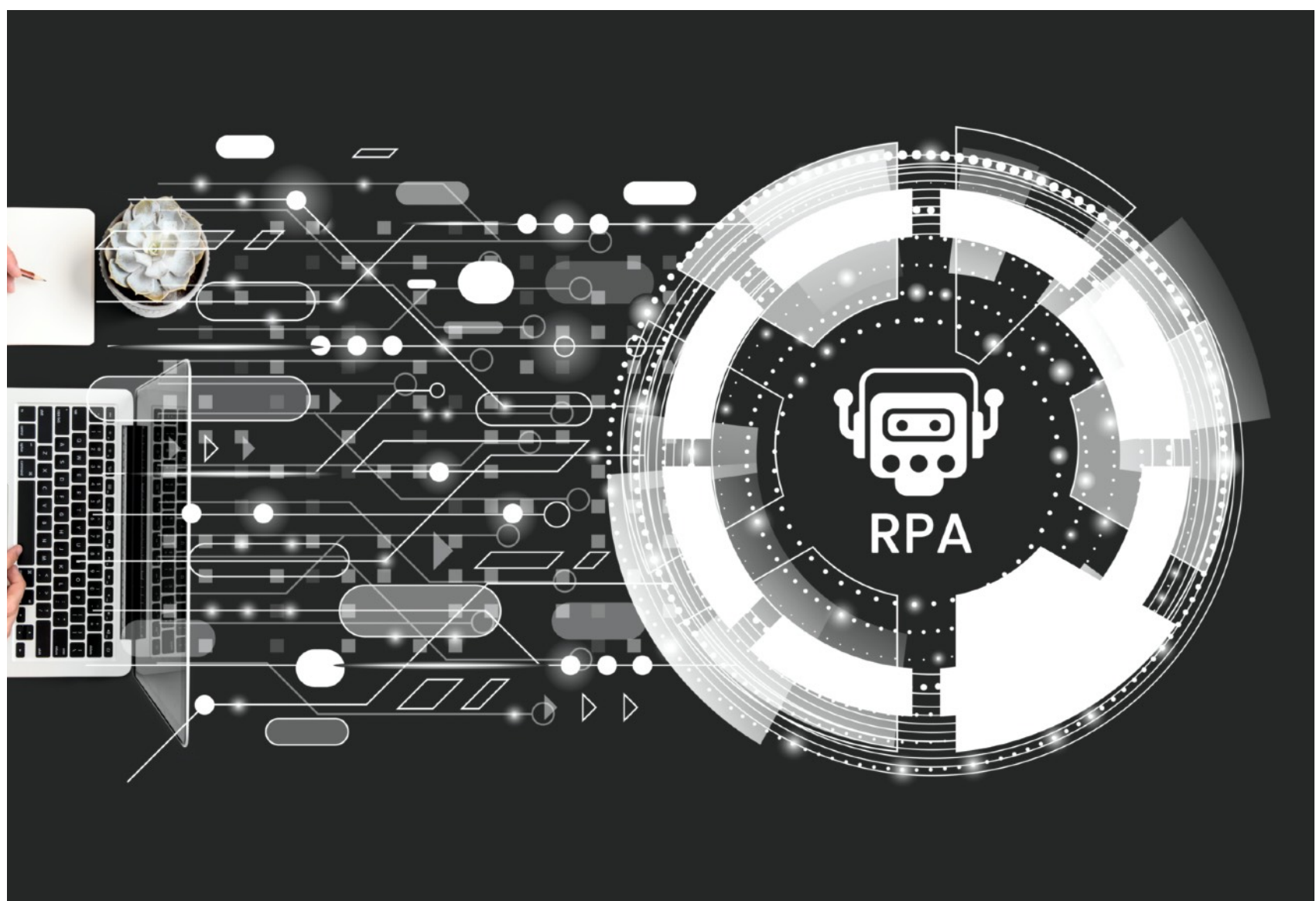
India will have over 749 million internet users and 518 million social media users, making it the second-largest online population behind China. India is particularly positioned to capitalise on the \$1.1 trillion Web3 market opportunity, as a significant proportion of Web3 developers are situated here and the number of online transactions is rising rapidly.

Certainty around policy and regulations is needed and would help the segment. Industry initiatives such as the Bharat Web3 Association are beginnings in the

right direction for creating a conducive environment for its development and driving collaboration. India will shortly assume the leadership of the G20. Therefore, the nation will play an important role in creating the Web3 and digital assets strategy for the G20 collective. The policymaking process should prioritise the development of an all-encompassing, facilitative framework for a new digital economy that positions India as a powerful Web3 leader.



7 New-age technologies will play a key role in citizen service delivery and ensure ease of living in India



More than **93%** of the respondents felt that Governments can use futuristic technologies like AI, ML, IOT, Blockchain to enhance citizen service delivery in India.

New age and futuristic technologies would soon be at the core of citizen service delivery in India, and the journey towards the same has already started. Governments have been using AI, ML, IOT in areas such as healthcare and education. Information dissemination, response to queries and grievance redressal using Chatbots have also been successfully implemented in organizations such as IRCTC. Multiple pilot implementations of Blockchain has taken place in issuance and storage of certificates, land and property registration in states.



Citizens are also extremely optimistic about the potential that Government service delivery has when new age technologies are used. An overwhelming 93% citizens felt that Governments can use futuristic technologies to enhance service delivery and bring in ease of living.

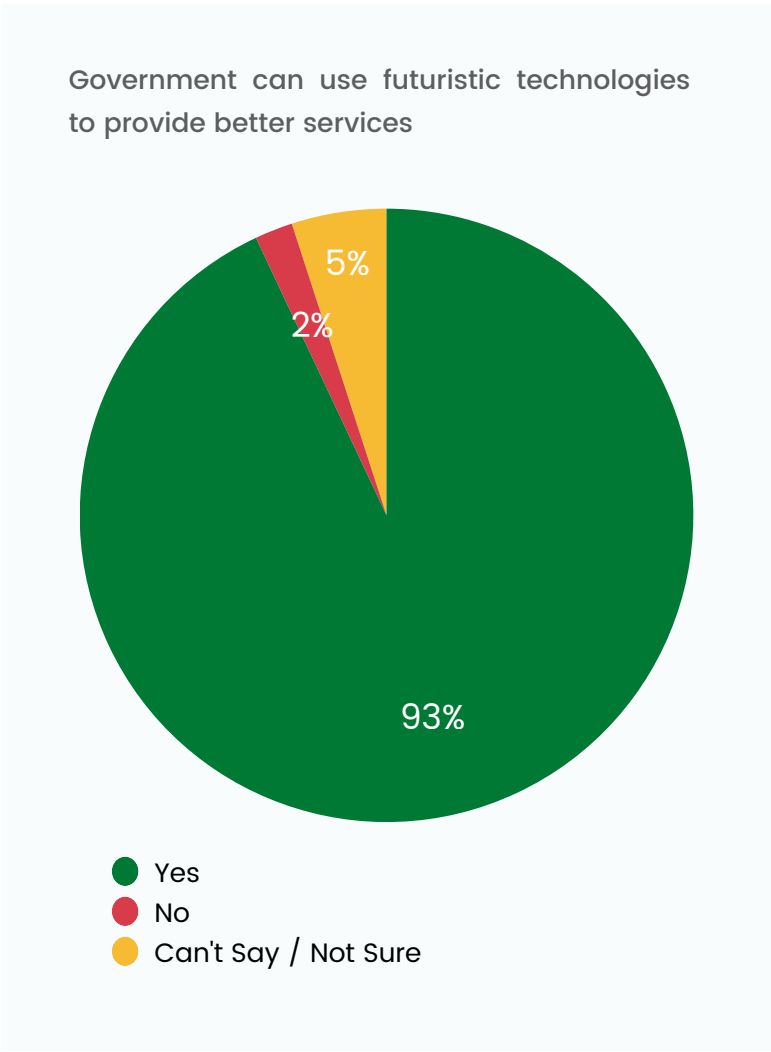


Fig 8: Leveraging Technology for better services

Some of the instances of use of new age technologies in citizen service delivery include:

- IRCTC uses an AI driven Chatbot for responding to queries of citizens / passengers and providing them requisite information
- Govt. of India launched an official WhatsApp chatbot (by the Ministry of Health and MyGov and developed by artificial intelligence-focussed start-up) which was made available to all WhatsApp users for free in English and Hindi. The AI driven chatbot on Whatsapp helped people with coronavirus-related information and crossed 30 million users in India
- Govt. of India is using AI and Big data analytics in Tax compliance and potential fraud detection
- Government has launched a Centre of Excellence in Blockchain technology. The CEO has focused on four (4) products - Document Chain, Certificate Chain, Property Chain and Drug Logistics Chain)

Use of technologies like AI, ML, IOT, Blockchain in citizen service delivery is here is stay. It would make services available real-time and would enhance ease of living in the long term.

Our View

The role of new age technologies in citizen service delivery and ease of living should go beyond the traditional use cases and look at using the same for a choice based proactive service delivery model based on family ID. States like Haryana have successfully implemented a similar program called Parivar Pehchan Patra. Various other states

are in the process of implementing programs of similar nature. The program should look at using AI and analytics to create schemes and benefits targeted at particular beneficiaries, thus bringing in personalization and ensuring that there is saturation in implementation of schemes.



8

5G will play a critical role in enablement of new age technologies

83% of the respondents surveyed felt that 5G will play a critical role in enablement of new age technologies.



5G is expected to take the industry by storm with more than 500 million 5G subscribers (forecasted to consume 50 GB of data per month ²¹) expected within the next 5 years, making it one of the highest in the world. The country is ready for 5G and the same can be gauged from the fact that India has a very high level of 4G adoption, thus indicating the building of the subscriber base to transition to 5G. **It forms an important cog in the adoption and prevalence of futuristic technologies like AI, ML, IOT as it provides a faster, more reliable network connectivity to allow seamless flow of data.**

The global 5G services market size is projected to grow from \$53 billion in 2020 to \$249.2 billion by 2026 at a CAGR of 29.4 per cent. ²² The pandemic propelled enterprises to resort to digital transformation, including an inclination towards Artificial Intelligence (AI), edge computing, Internet of Things (IoT) and Machine Learning (ML) in India. These emerging technologies depend on the high bandwidth, low latency, and highly reliable communication that 5G can offer. In the age of Industry 4.0, smart industries powered by the 5G network can act as socio-economic multipliers to achieve the vision of 'Digital India'. 5G-enabled digitisation is estimated to generate incremental revenue worth \$17 billion by 2030 in India by redefining businesses with limitless connectivity. ²³

Fixed Wireless Access (FWA) is one of the most exciting use cases of 5G for India. India has over 6 lakh villages, and over 25,000 villages still lack mobile or internet connectivity. Odisha has the maximum number of villages without mobile or internet, while over 70 percent of Arunachal Pradesh's villages remain unconnected. ²⁴ Laying fiber in remote areas and mountain terrains is a herculean task for telecom operators, in terms of time and cost. 5G FWA would enable telcos to deliver high-speed mobile broadband services and connect users in these remote areas with one fixed point getting 5G network. Airtel, in partnership with Ericsson, conducted India's first rural 5G trial. NSA mode enabled 5G coverage for over 10 kms., with speeds reaching 100Mbps. ²⁵ The results were reassuring and shall go a long way in bridging the digital divide even in the remotest geographies of the country. The wireless technology can add to the nation's economic growth by \$455 billion (INR. 36.4 trillion) between 2023-2040. ²⁶

²¹ <https://www.ericsson.com/>

²² <https://www.fisglobal.com/>

²³ <https://www.ericsson.com/>

²⁴ <https://www.indiatoday.in/>

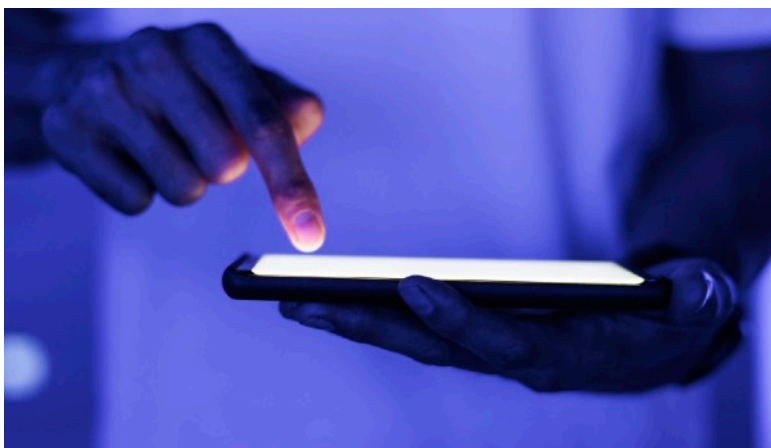
²⁵ <https://www.businessworld.in/>

²⁶ <https://www.livemint.com/>

The advanced manufacturing sector allows for the most significant 5G/IoT opportunity in India by catapulting India's flagship Aatmanirbhar Bharat initiative. **The Production Linked Incentives (PLI) Scheme for Telecom and Networking products can leverage India's position in becoming a leading export hub for the manufacture of 5G equipment ecosystem.** Cell and process automation, remote assistance and robot control, AR/VR for training and maintenance, logistical tracking and autonomous vehicles for goods transfer within a factory unit are some use cases of 5G-enabled manufacturing in India. **5G is also expected to bring down the cost of logistics in India.**

Financial inclusion is pivotal for reaping social and commercial benefits. 5G can enable mobile apps and remote banking, especially in remote rural areas which physical banks have not penetrated yet and support the growth of small and medium-sized enterprises (SMEs) through fixed wireless connectivity and greater internet penetration for quick services.

Additionally, 5G can play a pivotal role in the digital transformation of smart cities along with the use of IoT. It can provide smart utility services such as street lighting, car parking and automated traffic management, high connectivity and citizen engagement with AR/VR. Given that about 70 per cent of the world's population is projected to dwell in cities by 2050, 5G-enabled urban transformation can influence safety, security, and immersive tourism.



When we asked regarding the impact of 5G on adoption of new age and futuristic technologies, an overwhelming **83%** saw a potential positive impact.

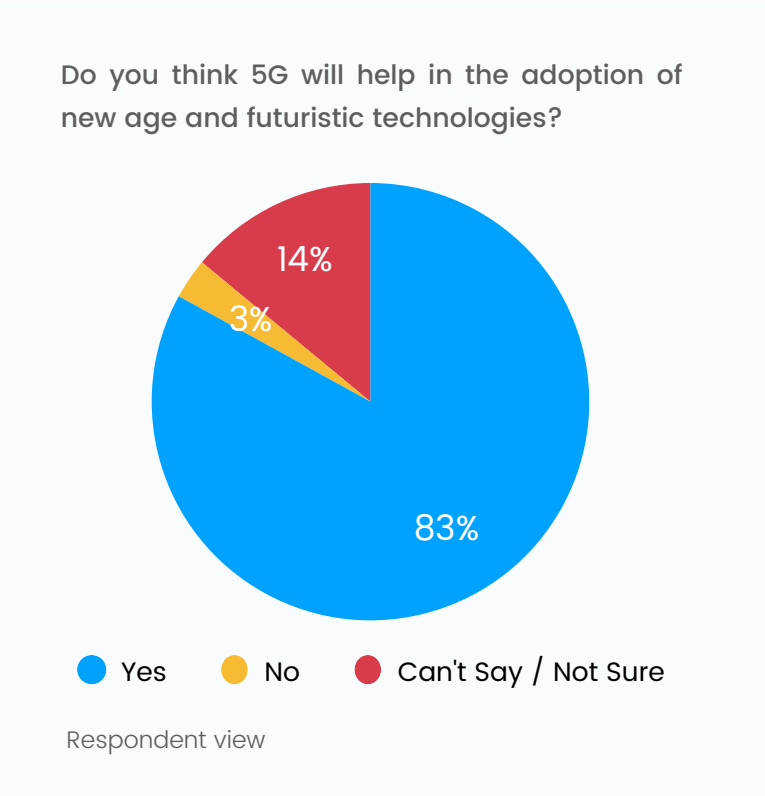



Fig 9: 5G role in adoption of New Technologies

Similarly, nearly **86%** of the companies we spoke with felt that there would be a positive impact of 5G on implementation of futuristic technologies.



At the recently held India Mobile Congress 2022, telecom major Reliance Jio showcased the use case of 5G in the education sector and the benefits of a collaborative and immersive experience that 5G will usher in the industry, including how 5G can connect classrooms across the country with a teacher at a central location. Virtual reality (VR) was used to explain complex concepts to the students.



5G can provide e-health through remote diagnostics and surgery through the tactile internet, enabling healthcare in remote and rural areas. Vodafone India's 5G trials are leveraging the power of 5G to provide healthcare access to remote parts of the country.



EXPERT VIEW

The BYJU'S Lab in London is dedicated to the exploration of cutting-edge technology that can be both useful and usable in education. We already use augmented reality, virtual reality, AI and computer vision in our products to offer an increasingly personalized and immersive experience to our students. It's possible to learn anatomy on our learning app by taking a stroll inside the human body. It's also possible for a student to take a VR field trip to the Amazon rainforest to learn about its ecosystem.

A single educator at BYJU'S can today provide personalized attention to every student in a batch of 20 at once by accessing real-time analytics. Technology can today help predict patterns that reduce school dropouts. Tomorrow's tech will make it possible to accurately predict the perfect career path of a STEM student. Most importantly, the evolution and dissemination of tech will make education truly inclusive and equitable.



Our View

With increasing mobile data user consumption, India's 5G subscribers is expected to increase exponentially. 5G is also going to ensure maximum benefits of technologies like IOT, AI, ML are reaped as data exchange would be faster, seamless and with minimal latency.

As Government aims to make India a USD 5 trillion economy over the next few years, 5G-enabled digital transformation has the potential to radically transform lives, bridge the digital divide, and open avenues for socio-economic growth by providing sustainability, productivity, and efficiency across all

new-age technologies in India. However, there needs to be a focus on nurturing **R&D capabilities** to bolster India's adaptability for the 5G network.

There is a need for **collaborative and co-innovative action** between the government and other stakeholders such as enterprises, telcos, start-ups, technology industries, and academia for bringing up reforms to provide incentives to smart industries that use 5G to provide better services to citizens.



9

Adoption of new age technologies will also bring in critical cyber related challenges

69% of the people surveyed felt that cyber related challenges will increase once.



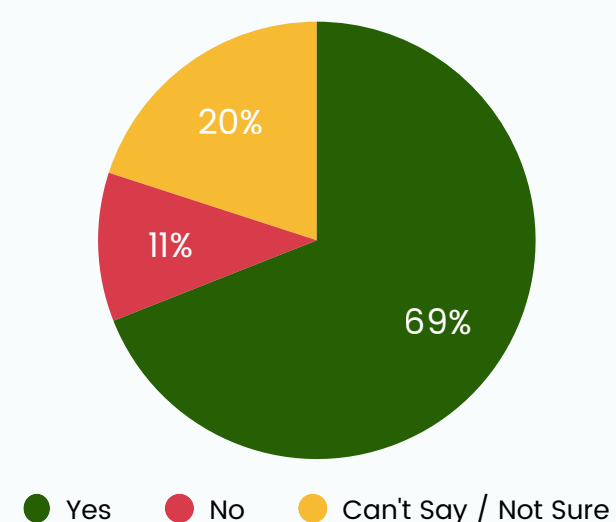
The future of everything from governance to administration and working to thinking is changing today. With the fast-paced adoption of technology world is becoming more technology driven than ever. Futuristic and emerging technologies such as Internet of Things (IoT), Artificial Intelligence (AI), Blockchain and data mining are at the centre of changing the rules of the game.

However, the dynamism is also bringing with itself a whole new domain of threat perception which was hitherto un-anticipated. The nature of these threats also lays bare open the vulnerabilities of the new systems and sheds light on systemic unpreparedness. Cyber security issues have thus come to be recognised as a strategic part of planning.

Based on the inputs taken from citizens, **69%** people felt that cyber threats would be a matter of concern with advent of futuristic technologies.

Fig 10: Increasing Cyber Threats

Would cyber threats increase with the use of futuristic technologies?



Corporates also see this as a challenge, and an overwhelming majority of the people we spoke with suggested that cyber related challenges will be prominent and should take a priority.

What are cyber-related challenges?

Cyber-attacks and cybercrime are one of the biggest challenges that humanity is facing today, and the situation would become more alarming in the days to come. It is predicted to cost the world more than USD 6 trillion annually. FBI had stated that over USD 12 billion has been stolen by cyber-criminals through people-centric email compromise scams in 2018 alone. Conservative estimates show cyber-criminal revenue worldwide of at least USD 1.5 trillion to date. To put that into perspective, if cybercrime was a country, it would have the 13th highest GDP in the world.

The challenge is also severe in India too. India was the 15th worst country in a recent cybersecurity ranking of 60 nations by a consumer tech review firm. The same report also stated that India is the 6th worst country in terms of mobile phones impacted by malwares and 11th worst country in terms of desktops impacted by malwares.²⁷

Cyber challenges or attacks can be of multiple types including:

- Malware, including virus, worms, trojans, ransomware, spyware
- Phishing, including spear, whaling and pharming
- Man-in-the-Middle (MitM) Attacks
- Denial-of-Service (DOS) Attack
- SQL Injections
- Zero-day Exploit
- Password Attack
- Cross-site Scripting
- Rootkits
- Internet of Things (IoT) Attacks

²⁷ Source: Comparitech



In October, India's largest integrated power company TATA Power's IT Infrastructure was impacted by a Cyber attack.



In October, a media report suggested that credit card details of over nine million users globally were released on a dark web marketplace.

Data Privacy

Another challenge that may emancipate is to ensure data privacy and protection with such a huge quantum of data being generated through use of IOT, AI, ML. Government of India is expected to enact a legislation centred around **Data Privacy and Protection** soon, which should address many of the challenges and provide an option for grievance redressal as well.

Measures of Mitigation

With the usage of futuristic technologies, there can be scope of cyber attacks and concerns on data privacy. However, it can be addressed through stronger legislation for ensuring data privacy and continuous training and handholding of citizens related to cyber security.

Our survey also showed that an overwhelming 72% of the respondents felt that continuous and right training and awareness programs are the need of the hour, and Governments and the corporate sector should focus on the same.

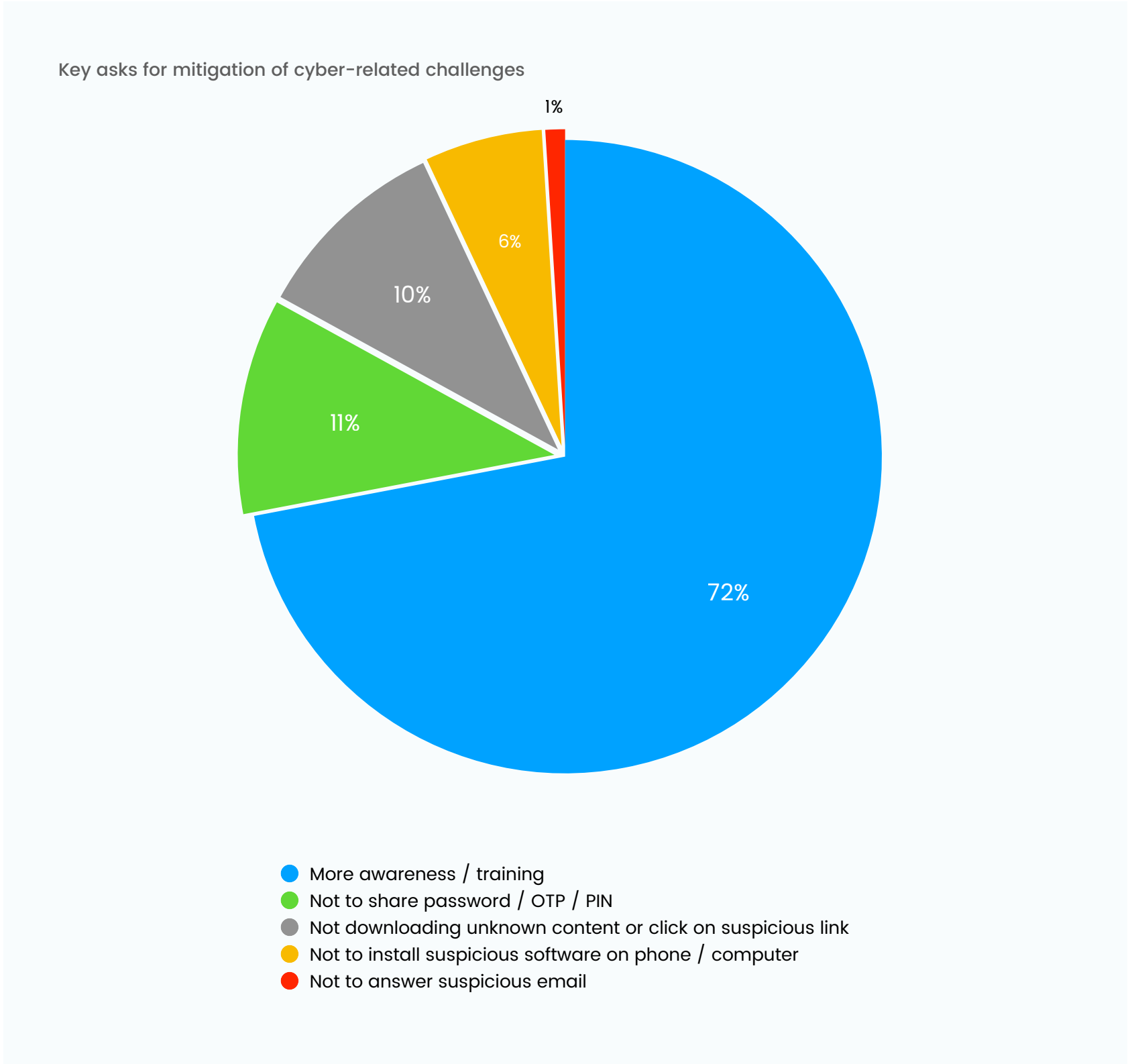


Fig 11: Awareness key to mitigating cyber related challenges

Our survey also showed that an overwhelming 72% of the respondents felt that continuous and right training and awareness programs are the need of the hour, and Governments and the corporate sector should focus on the same.

There can be innovative programs which can be thought of, including –

- Mandatory cyber awareness training programs from Grade 9 onwards till graduation.
- Mandatory cyber awareness training programs for all employees in Corporate having 10 or more employees
- Awareness films shown during movie screenings
- Cyber awareness month being observed with large scale programs to spread the message

Our View

Use of futuristic technologies is definitely the need of the hour, and the country is ready for it. However, use of technologies like IOT, AI etc. will bring challenges in cyber security. Further, an enhanced focus on awareness and training of citizens to understand the challenges related to cyber and to be prepared to tackle the same, needs to be a priority. The awareness and training should start from an early age, right from schools. That would help in building a truly cyber aware society and country.



10

Skill development of professionals in new age technologies will be a game changer

Majority of the organizations feel that availability of skilled workforce trained in new age technologies will be a key challenge in adoption of the same.



Of the 3.32 billion workforce in the world today, less than half is skilled. However, with the changing nature of jobs, of the four million existing jobs about 60–65% will change in less than half a decade. Currently, as per a recent estimate only 12% of India's workforce is digitally skilled. ²⁸

The above statistics show that while we progress on the path of adoption of new age and futuristic technologies, there would be a need to urgently look at relevant technical education of new entrants and upskilling and reskilling of people working in the industry in other technology areas. Some of the facts (non-exhaustive list) which highlight the talent shortage that this industry is facing are –

- Global Blockchain industry is expected to be around USD 69 billion in the next 5 years, growing 12–13 times from the present times. However, in India, not even 1% of the present IT workforce is well versed with blockchain and hence there is a skill gap, but a huge opportunity
- Since 2018, India has witnessed a 138% increase in crypto and blockchain related jobs. The country's Web3 talent pool is growing at the fastest rate worldwide, at around 120% in the next 1–2 years ²⁹
- India will need 9 times as many digital skilled workers by 2025 ³⁰

²⁸ <https://tech.hindustantimes.com/>

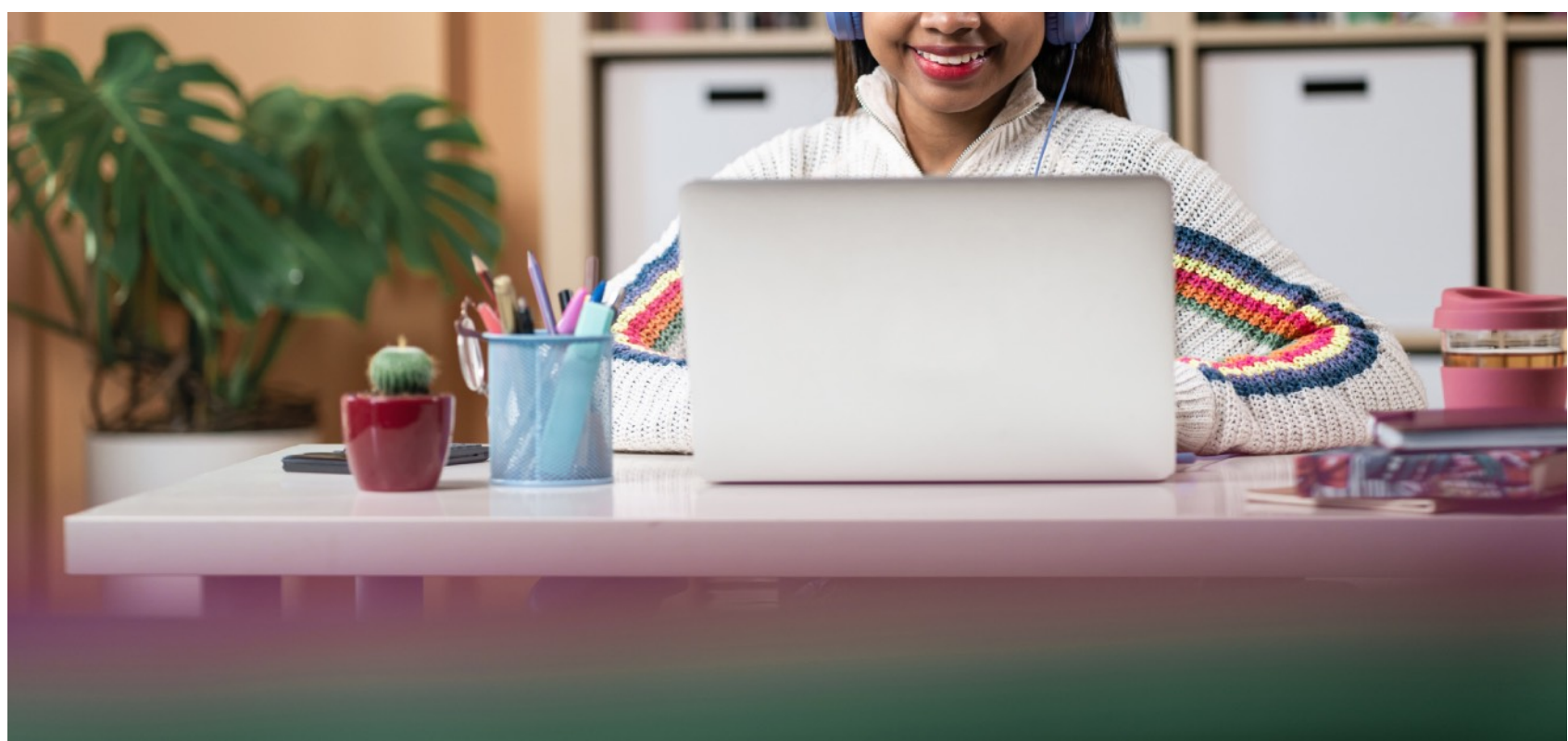
²⁹ Source: NASSCOM

³⁰ Source: AWS Report

Professionals would need a mix of technical, functional, sectoral and behavioural skills to succeed in this field and be future ready. Students **need to focus on learning technology related aspects of AI, ML, IoT, AR/VR as well as newer decentralized technologies like p2p, web3, blockchain.** Adding complexity to it will be the fact that most of the traditional technical education institutes have still not focused on these newer technologies, and the same needs to be taken up on priority.

However, the good news is that Government has taken cognizance of the requirement of technical education and skilling in the field of these new age technologies, and the same is extensively covered as part of the **National Education Policy (NEP) 2020.** Some of the interventions suggested in NEP include –

- Concerted curricular and pedagogical initiatives, including the introduction of contemporary subjects such as Artificial Intelligence, Design Thinking, Holistic Health, Organic Living, Environmental Education, Global Citizenship Education (GCED), etc. at relevant stages will be undertaken to develop these various important skills in students at all levels.
- One of the permanent tasks of the NETF will be to categorize emergent technologies based on their potential and estimated timeframe for disruption, and to periodically present this analysis to MHRD. Based on these inputs, MHRD will formally identify those technologies whose emergence demands responses from the education system.
- The National Research Foundation will initiate or expand research efforts and in the context of AI, NRF may consider a three-pronged approach: (a) advancing core AI research, (b) developing and deploying application-based research, and (c) advancing international research efforts to address global challenges in areas such as healthcare, agriculture, and climate change using AI.
- Universities will aim to offer Ph.D. and Masters programmes in core areas such as Machine Learning as well as multidisciplinary fields “AI + X” and professional areas like health care, agriculture, and law.





Mr Simarpreet Singh

Director JIS Group and National Committee Member
ASSOCHAM

EXPERT VIEW

Integration of tech, education, and skills in a future-ready India

Technology has always been a major driver of change. With COVID-19 and the New Normal, we know that Digital Transformation and Rapid Innovation will continue to improve Ed-tech outcomes.

Smart India provides more opportunities for businesses, governments, and social sector institutions to increase productivity, innovate, and redefine offerings. Education serves as the core of national growth and investing in the development of new skills like Machine Learning, AI, Block Chain, IoT, and creative engineering will be crucial in the future to capitalize on this special demographic dividend. Technology is not just connecting classrooms to classrooms; it is connecting students to authors, researchers, scientists, politicians, and other professionals and experts.

Today, new technologies have fostered resurgence in the learning-by-doing movement through exploration, play, discovery, and design. As we work toward Atma Nirbhar Bharat, creating a healthy learning and skilling ecosystem requires collaboration between government, business, and academia. A synergy between the three will create an environment conducive to the development of our future-ready India.





Mr Rajesh Kumar
Co-Founder & CEO
Kalvium

EXPERT VIEW

The need for education and skilling ecosystem to evolve

Software and technology are eating up more and more of the world, and our higher education & Skilling ecosystem needs to evolve faster to keep pace up with rapid innovation happening in the current technologies (AI, IoT, AR/VR) as well as newer decentralized technologies (p2p, web3, blockchain).

The next generation of digital-native engineering talent can be primed to keep up with the pace if we focus on learning how to learn, and fast!



Our View

There is a definite and urgent need to focus on technical education and skill development in the fields related to new age technologies such as AI, ML, IOT, Blockchain. The responsibility of the same lies with traditional technical education institutes, new age EdTech institutes and corporates which need to focus on upskilling and reskilling its employees. India has emerged as a strong player in the IT industry and needs to continue the same with AI, ML, IOT, Blockchain, Web3 etc.

There is a need to create awareness about the field and the need for skilling amongst the present workforce, as well as the ones entering

the industry. Skilling has to be a mix of theoretical knowledge and the industry requirements, which will vary depending upon on the sector and industry in which new age technologies like AI, blockchain, Web3 is being applied in. This is where collaboration and synergy between institutions and industry is needed to understand the needs of the industry and bake them into course modules so that students are able to get the right skill and knowledge. Last, but not the least, existing web and app developers need to start cross-skilling themselves in new age technologies such as blockchain to remain relevant.



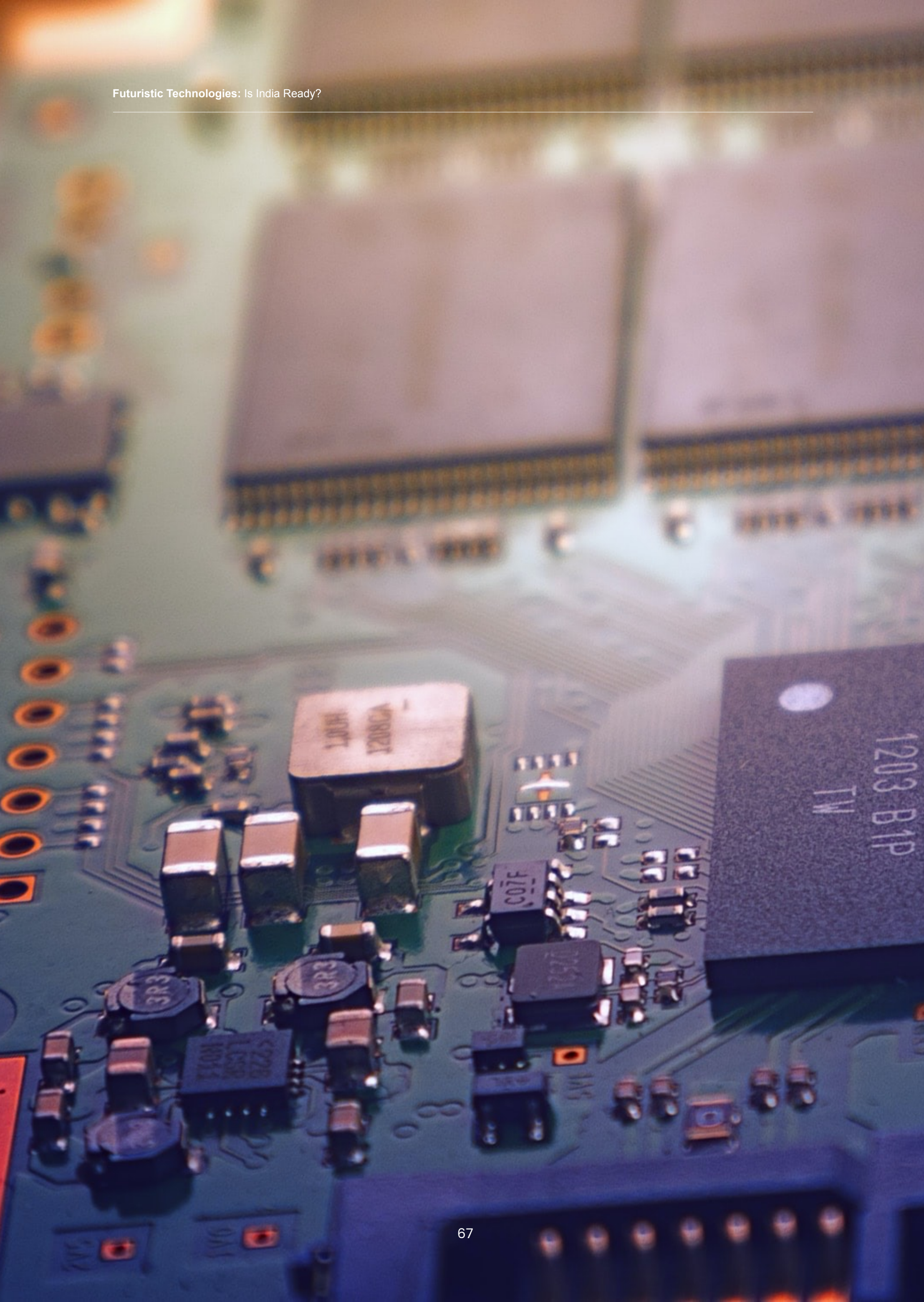
11

Recommendations

1. India has enormous potential for embracing futuristic technologies and is well placed for it. However, **attention should be paid to skill upgrading, training, and technical education** to ensure that we have a qualified workforce to be able to contribute to this ever-rising domain.
2. The National Education Policy (NEP) 2020 lays significant emphasis on futuristic technologies like AI, ML, Blockchain. Central and State Governments need to **focus on implementation of the NEP**, so that the benefits can be reaped.
3. With ever changing contours of how education is delivered, there is a need of collaboration between traditional technical education institutes, new age EdTech organizations and corporates to ensure the right skills in people entering the workforce and existing employees being upskilled and reskilled.
4. There needs to be a **collaboration and synergy between institutions and industry** to understand the needs of the industry and create a right training and learning program for it.
5. The drive for new age technologies would need a clear policy push. While there have been policy level interventions suggested, planned and implemented by Govt. of India and some of the State Governments like West Bengal, Telangana, Tamil Nadu, Maharashtra, Haryana, Gujarat etc., however a clear policy level push focused on skill development, usage of technology in Government, incentive for firms focused on futuristic technologies would be needed.
6. The government should also focus **use of futuristic technologies in citizen service delivery**. One consideration should be on developing a proactive service delivery model based on family ID such as Parivar Pehchan Patra as implemented in the state of Haryana. Further, **AI and analytics can be utilized to create schemes and benefits targeted at beneficiaries**.
7. FinTech industry has tremendous potential in India, and the **focus should now shift towards financial products for the less banked and underbanked, including the MSMEs**. Use of AI, analytics and digital shall be crucial in this space.
8. **Data privacy and security are very critical** considering the huge quantum of data to be generated. The same would have to be safeguarded through adequate Acts, Rules and Policies.
9. While futuristic technologies have immense benefits and need to be adopted, **data privacy and cyber security also needs to be plugged into the design** of such solutions itself.
10. **Creating awareness and ensuring training of citizens** to understand the challenges related to cyber shall be critical.
11. Cyber related training and education should be imparted right from school level itself and corporates above a certain employee threshold should be strongly encouraged to drive a culture of cyber safety and bring adequate training programs for the same.

12. Protection of personal information by being transparent, ensuring appropriate use and disclosure etc. can go a long way in creating a safe and cyber risk-free environment.
13. There is an urgent need for the society to come together and agree on a framework that can guide government and organizations on the ethics of the data.
14. Big data and analytics have a significant role to play. However, design focus should also be on strong ownership of individual's personal data, consent of individuals, accountability, transparency and fair compensation in exchange for use of personal data.
15. Web3 technologies have a significant potential in the country. However, a **certainty around policy and regulations is needed** and the same would help the segment. India can use the G20 platform as it assumes the presidency to **create a global consensus and framework** around Web3 technologies and its future.
16. In order to increase India's capacity for adaptability to new age and future technologies such as the 5G network, an **emphasis on developing R&D capabilities is necessary**. The focus on R&D can help development of innovative programs and knowledge advancement which can further help enhance efficiency, productivity, and sustainability for all emerging technologies in India.





About ASSOCHAM



ASSOCHAM initiated its endeavour of value creation for Indian industry in 1920. Having in its fold more than 250 Chambers and Trade Associations and serving more than 4,50,000 members from all over India. It has witnessed upswings as well as upheavals of Indian Economy and contributed significantly by playing a catalytic role in shaping up the Trade, Commerce and Industrial environment of the country.

Our legacy has helped build a strong foundation for future endeavors wherein we serve as the Knowledge Chamber for the industry and become the conduit between them and the Government to foster development of a New India. Seen as a proactive and forward looking institution, ASSOCHAM is fully equipped to meet the aspirations of Corporate India in the new world of business.

ASSOCHAM has emerged as the fountainhead of Knowledge for Indian industry, which is all set to redefine the dynamics of growth and development in the technology driven cyber age of 'Knowledge Based Economy'. We aim to empower Indian enterprise by inculcating knowledge that will be the catalyst of growth in the technology-driven global market and helps them upscale, align and emerge as formidable player in respective business segments.

Aligned with the vision of creating a New India, ASSOCHAM works as a conduit between the industry and the Government. ASSOCHAM is seen as a forceful, proactive, forward looking institution equipping itself to meet the aspirations of corporate India in the new world of business. ASSOCHAM is working towards creating a conducive environment of India business to compete globally.

As a representative of Corporate India, ASSOCHAM articulates the genuine, legitimate needs and interests of its members. Its mission is to impact the policy and legislative environment so as to foster balanced economic, industrial and social development.

ASSOCHAM derives its strength from its Promoter Chambers and other Industry/Regional Chambers/Associations spread all over the country.





About Primus Partners

Primus Partners is a management consultancy and solutions focused firm that aims to navigate through the many opportunities that exist in the country. In a short period of time, Primus has established itself as a fast growing and premier Consulting firm with marque projects and clients, including assignments abroad.

The firm has grown significantly and presently employs more than 150 professionals across its 6 offices in India working on 110+ consulting assignments.

The leadership team at Primus brings over 200 person-years of experience across sectors to develop and implement winning strategies for India and clients in Public and Private Sector.

Quality has been a focus right from start and the firm has been assessed at CMMi Level 3. Similarly, the firm also has 4 ISO Certifications, thus reaffirming its commitment to quality, information security and environmental norms.

People centric policies and development form the core of the firm and Primus has been certified as Great Place to Work for 2 years in a row.

Primus offers unique approaches to its clients to examine futuristic ideas required for the growth of a sector or ecosystem or organisation with key offerings being Public Policy Realisation, Investment Realisation, Impact Realisation, Technology Potential Realisation and Sector Potential Realisation.



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