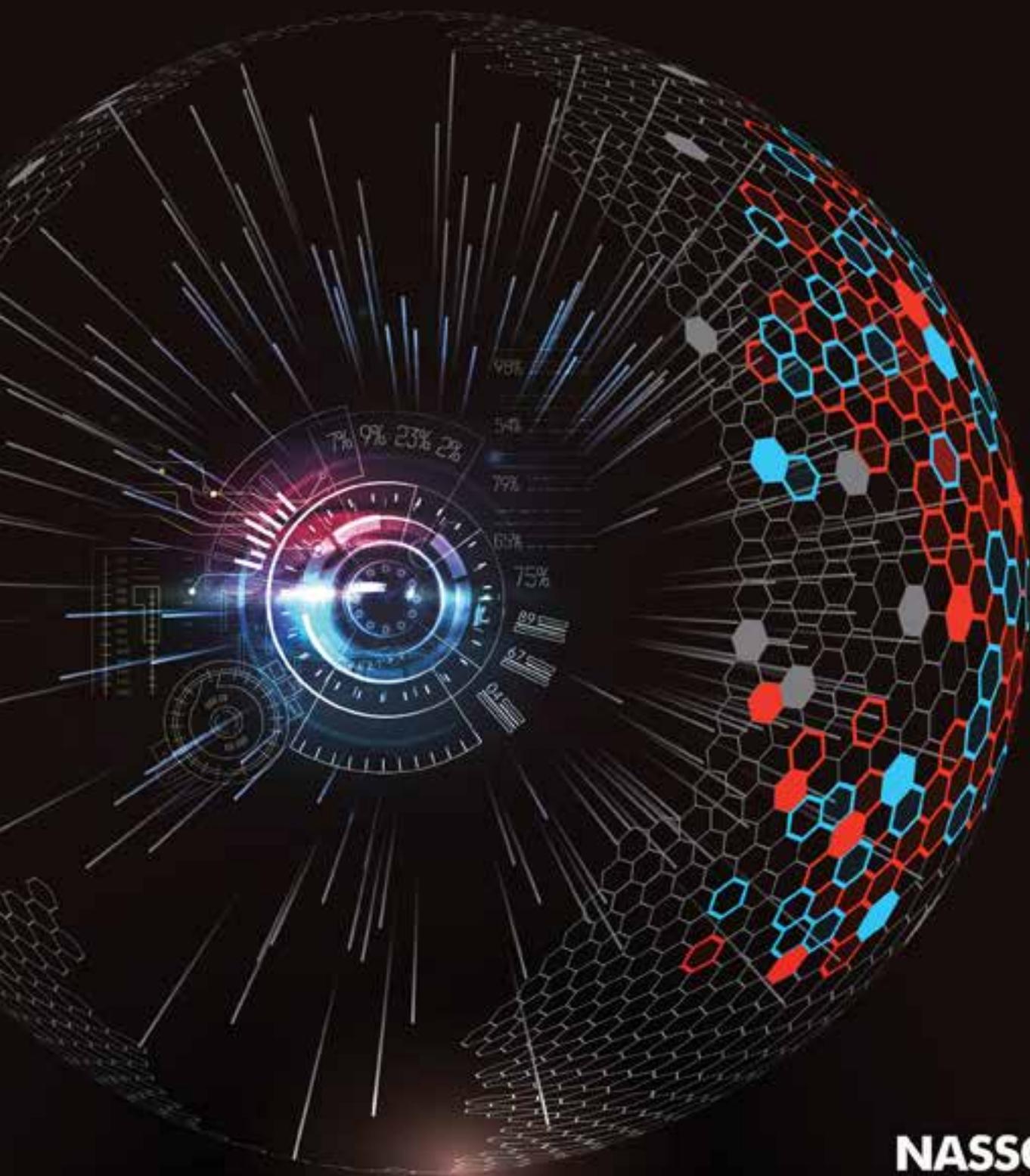


Technology Sector in India 2020

TECHADE

THE NEW DECADE / STRATEGIC REVIEW



NASSCOM®

NASSCOM®

Plot 7 to 10, Sector 126, Noida 201303, India
Phone: 91-120-4990111
Email: research@nasscom.in

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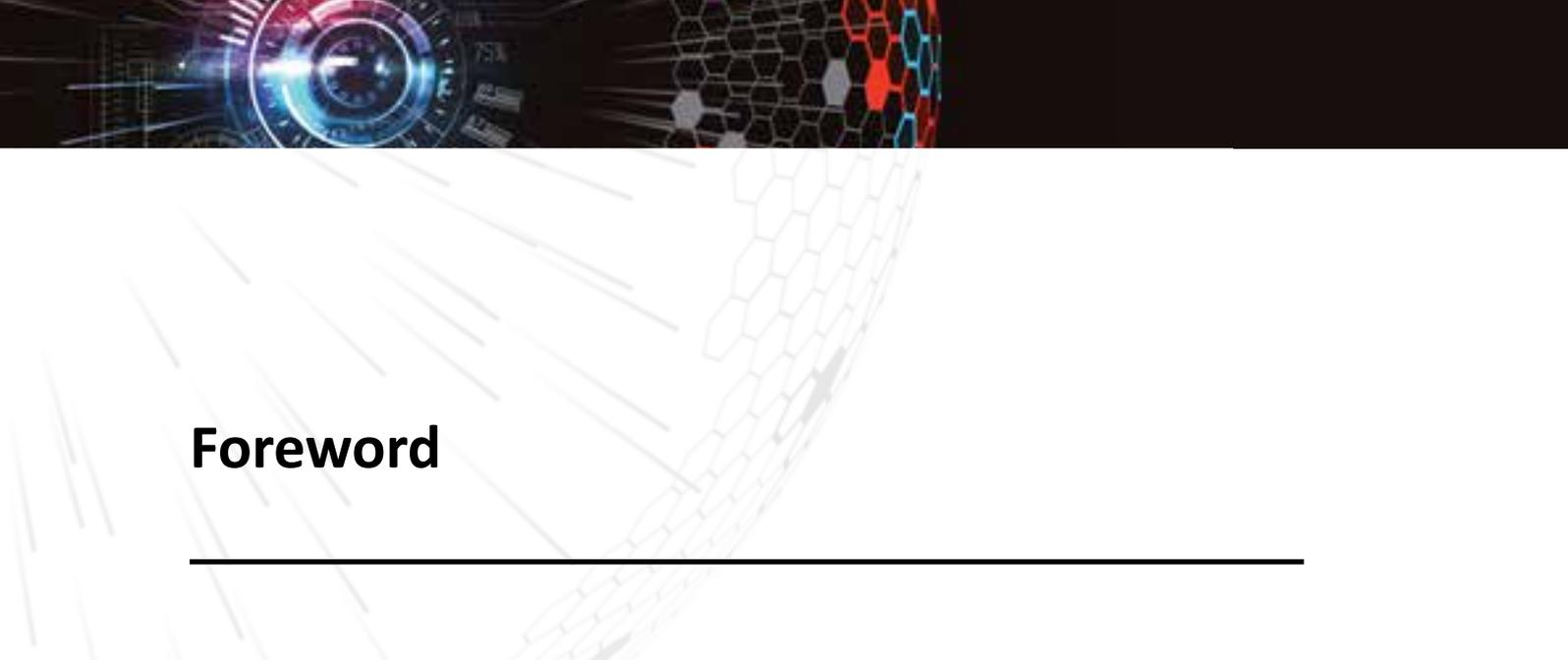
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TECHADE

THE NEW DECADE





Foreword

This time, a decade ago, the smartphone was not ubiquitous. The sharing economy had not started yet, it was early days for the subscription businesses, wearables were just fashion accessories and we were still trying to figure out social media. Jobs that are now performed by millions of people - driver partners, super hosts, data scientists, cloud architects, gif-makers, social media influencers, and millennial advisors - didn't even exist.

Technology innovation in the last decade was breathtakingly fast as business got intertwined with technology like never before. A key indicator of this trend was the growth of the Indian technology industry, which added over \$100 billion in revenues, and 2 million+ tech jobs in the decade.

Beware though- technology enabled disruption in the next decade promises to be even faster. We like to call this decade as the techade- where technology will create endless possibilities for a fulfilling and happy world.

Possibilities that enable innovations that focus on transforming the lives of people across the world.

Possibilities that can be limited only by our own imagination and intent.

For those familiar with the NASSCOM Strategic Review report, you would know that it provides an insightful take on key facts, figures and trends that define the progress of the Indian technology industry on an annual basis. You will find all that in this year's edition too.

The Indian technology industry is expected to grow at 7.7 per cent in the current financial year, and generate revenues of USD 191 billion. The industry continues to be a net hirer, employing 4.36 million people in total.

Additionally, given this is the start of an exciting new decade, and the fact that far reaching, global patterns in tandem with quick changing technologies are swiftly creating lucrative new opportunities while affecting current mainstays, we thought it would be imperative to talk about how can these megatrends play out and highlight their impact on technology industry opportunities.

The 5 key megatrends we see are-

1. Asian Economic Eminence: Home to 90 per cent of new middle-class urbanites and yielding 50 per cent of global GDP by 2030, Asia will become the largest consumption base for digital-native, mobile-first, and decisively individualistic consumers.

2. Mass Urbanization and Hyper-Personalization: *Two thirds of the world will live in cities. Urbanization will create hyperlocal clusters with distinct needs*

3. Environmental Sustainability Stress: *Climate change, urbanization, natural resource denigration and shrinking arable land will push more than 3 billion people to the verge of severe food and water scarcity.*

4. Data-Led Economy: *Global data volumes will continue to grow exponentially. End consumers assuming full control of their data may lead to the rise of the data barter economy.*

5. Disrupted Future of Work: *Work will be disrupted due to automation and machines working in cohesion with humans through technology assisted and skill based work cultures.*

Addressing these megatrends will require unprecedented coordinated action from governments, corporates and citizens, and technology will emerge as the foundation for success. Further, nine interconnected, rapidly evolving, high impact digital technologies- Big Data Analytics, Cloud Computing, Cybersecurity, Artificial Intelligence, Internet of Things, 3D Printing, Robotics, Blockchain, and Immersive Media can create opportunities upto USD 33 trillion.

The Indian technology industry will need to significantly increase the pace of its own transformation to grab a large share of the techade enabled opportunities.

With the Government of India's target to be a USD 1 trillion digital economy by 2025, stakeholders will need to collaborate to get the key pillars in place – a robust data strategy; a comprehensive cybersecurity policy to make India a trusted partner; talent, for a future-ready workforce; and investments in building innovation hubs and business friendly policies.

This year's Strategic Review is not only the annual report card it always was, but also provides a glimpse into the long term future for the technology industry. We hope you enjoy reading it, and we welcome your feedback and comments.

Debjani Ghosh
President, NASSCOM



Acknowledgements

The technology Sector in India report is NASSCOM's annual flagship publication that analyses the performance of the industry, traces its continual evolution and highlights key trends that are influencing and driving the sector forward. The NASSCOM Research team relies heavily on both primary and secondary research, internal and external research reports, and reaches out to stakeholders across the board – industry, government, research firms, etc. – for their inputs that add value to the report. We would like to thank all our stakeholders for their invaluable contributions, without which this report would not have been possible.

We would like to thank NASSCOM member organisations, who provided relevant data and insights about various industry trends and developments. We acknowledge the inputs and insights from all our research partners and various government bodies.

All sources and participants have been listed in the appendix section.

Table of Contents

2

Executive Summary

9

Chapter 1 Decade in Review

17

Chapter 2 Annual Industry Performance FY2020

- 18** Industry Performance-Overview
- 29** - IT Services
- 37** - BPM
- 46** - ER&D
- 54** - Software products & Start-ups
- 63** - eCommerce

71

Chapter 3 Megatrends Shaping Future Tech Opportunities

- 75** Asian Economic Eminence
- 79** Mass Urbanization and Hyper-Personalization
- 83** Environmental Sustainability Stress
- 87** Data-led Economy
- 91** Disrupted Future of Work

97

Chapter 4 Techade 2020- Digital Tech Opportunities

- 102** Cloud Computing
- 106** Big Data and Analytics
- 110** Cybersecurity
- 114** Artificial Intelligence
- 119** Internet of Things
- 124** 3D Printing
- 129** Robotics
- 133** Blockchain
- 138** Immersive Media

143

Chapter 5 Techade 20 - Annual Outlook

151

Chapter 6 Appendix

- 152** Glossary
- 158** Sources & Contributors
- 159** List of NASSCOM Reports Released in FY2020

Executive Summary

Introduction

“Most people overestimate what they can do in one year and underestimate what they can do in ten years.”

— **Bill Gates**

If the last decade (2009-2019) was one of unprecedented digital disruption, that impacted both businesses and society at large, the decade of the 2020s is expected to be one of individualism and hyper-personalisation.

Now everything is digital; technologies are deeply interwoven into every industry and across entire industry value chains so much so that it is becoming difficult to tell where business ends and technology begins and vice versa. For many traditional industries, particularly manufacturing, technology is now becoming the business. Technology is enabling industry convergence with firms seeing competition coming from companies outside of their sectors. The verticals where this is most evident is automobiles, eCommerce and in the recent times, manufacturing.

This trend is expected to continue over the next decade. 2020-2030 will be defined by specific megatrends: hyper urbanization, the relentless move of the population away from rural areas which will eventually give rise to multiple densely populated mini-cities; the shift of manufacturing hub away from China and to other locations will add to this trend. The demands from an ever increasing population (expected to touch 8.5 billion by 2030) will put enormous strain on global resources, exacerbated by climate change. Individual consumers will yield considerable influence on business; technologies like IoT/edge computing are enabling unprecedented levels of data generation from every possible device and equipment.

Revenues (USD billion)



FY2019

177

105

FY2009

72

68

FY1999

4

Employees (million nos.)



FY2019

4.1

1.9

FY2009

2.2

1.9

FY1999

0.3

These trends will open up new business opportunities for technology; technology will also play a critical role in addressing many of the issues highlighted above. We have identified nine key technologies that will play a significant role in facilitating these megatrends: Three foundational technologies (cloud, big data analytics and cybersecurity) and six advance technologies (AI/ML, IoT, additive manufacturing, robotics, blockchain and immersive media).

We take this opportunity to present to you NASSCOM's annual analysis – "Technology Sector in India: Techade-The New Decade". In this issue, we offer a decadal view – significant achievements of the last decade, the annual industry performance analysis and what lies ahead in the next decade in the context of the megatrends and the technological advancements.

Decade in Review - FY2009 to FY2019

The turn of the new decade presents a dramatically altered landscape of the Indian IT-BPM industry. The past decade (FY2009-FY2019) though, has laid the foundation for this transformation story.

The FY1999-FY2009 decade saw exponential growth of the industry in India – the industry added USD 68 billion in revenue, growing 18X; in terms of employees, the industry grew 8X to add close to 2 million people.

The past decade (FY2009-FY2019) saw the industry cross USD 150 billion in revenues (FY2016 was the watershed year) and stood at USD 177 billion in FY2019. Employee addition was again close to 2 million people, a 1.8X growth. While FY1999-FY2009



was a decade of growth, the last decade has been that of consolidation during which the industry succeeded in decoupling revenue and employee growth.

The industry has been spreading its wings across segments, geographies and verticals:

- Maturing from an industry with five key segments (IT services, BPM, ER&D, software products and eCommerce) a decade ago, to embracing digital solutions across nine technologies
- The Billion \$ club: The industry today boasts of eleven companies with annual revenue well over USD 1 billion and 24 start-ups that have attained unicorn status
- Expanding footprint across emerging markets: APAC saw a three-fold growth; emerging verticals grew 3.5X

The industry has also been strengthening the foundation of India as an Innovation hub: India today has 24 unicorns with over 50 soon to be unicorns and start-ups are growing at 12-15 per cent y-o-y with 9,000+ start-ups incepted over 2014-19.

The sector is one of the highest impact creators for the country – economic, innovation, job creation and inclusivity.

Currently, it accounts for over 8 per cent relative share in India’s GDP and has played a significant role in offsetting India’s import bill. Over FY2009-FY2019, the industry has added USD 105 billion in revenue

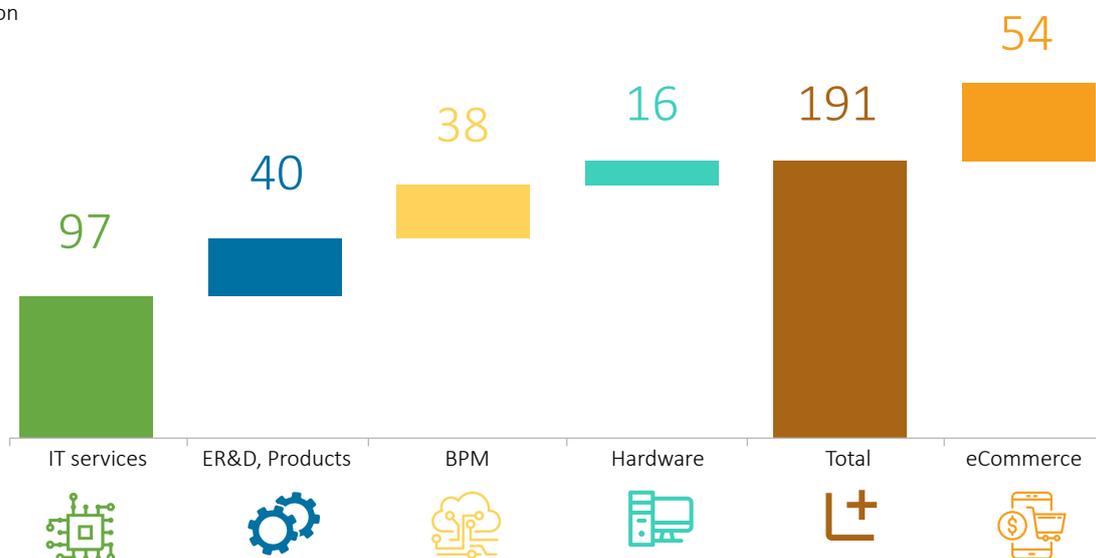
and over 2 million employees. It has emerged as the champion of inclusivity – women employees today account for over 35 per cent (1.4 million) share in total industry employee base.

Overview – Indian Technology Revenues FY2019-2020

- Total revenue (incl. hardware) up 7.7 per cent over FY2019 to USD 191 billion
- Digital revenue share between 26-28 per cent
- IT services: Approaching the USD 100 billion mark; growing at 6.7 per cent; Modernization of the core services led by automation
- BPM: Growing at over 8 per cent; Convergence of digital technologies across all service lines gained prominence; AI, analytics and automation, created new revenue streams and business models
- ER&D: The fastest growth segment at ~11%, driven by increased focus on digital engineering for better UX and personalization; greater adoption of platforms and cloud; consolidation to build full-stack capabilities
- Software Products and Start-ups: Growing at over 9.5 per cent in FY2020, driven by product development around AI, RPA, cloud and analytics; growth in ERM, CRM, collaborative applications; strong performance of B2B product-based start-ups

Overview – Indian Technology Revenue FY2019-2020

\$ billion



- Shift from subscription-based model to gain sharing model; SaaS market grows on the back of digital technology-led use cases; increase in use of SaaS mobile apps
- eCommerce: Growing at ~25% in FY2020, driven by increasing penetration of m-commerce, growing demand for niche products and easy and secure digital payment channels; Social commerce gained traction

Megatrends defining the next decade: 2020-2030

The decade of 2020-2030 will witness major, non-linear transformations, manifesting as global megatrends that will generate high-impact opportunities, at unseen speed and scale, necessitating just-in-time response agility from demand-supply-trust ecosystems built on a strong core of digital technologies and connectedness.

NASSCOM surveyed producers and consumers of technology products and services to understand their

views on the identified megatrends. While consumers would like more sustainability focus, producers identify more opportunities with Asia’s economic rise, technology-led work shifts, and data-led economy.

An estimated 8.6 billion global population, growing at its ever-slowest rate of 7.3 per cent, will generate world GDP of USD 270 trillion, at the fastest decadal GDP growth rate of 6.7 per cent.

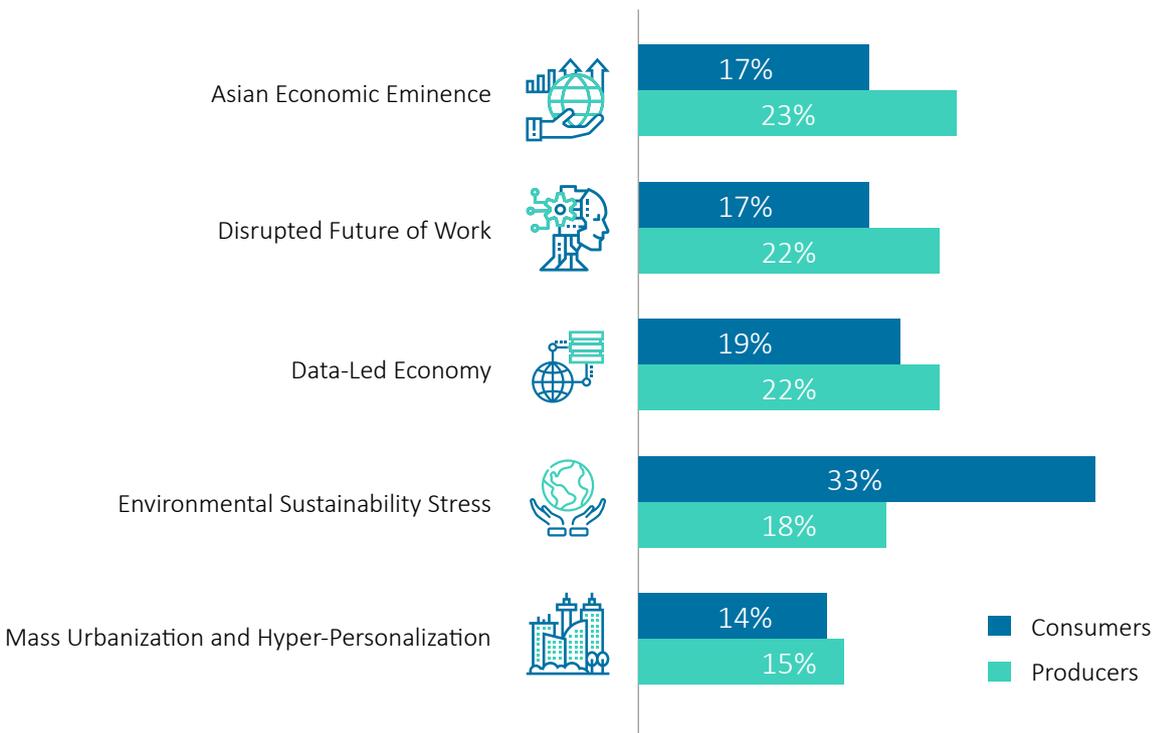
The global megatrends will unravel at their individually distinct pace. But combined, their impact on resource stress and environmental sustainability will have a strong balancing effect on the accelerating pace of growth and will cause sporadic swings in global and regional economic, social, and cultural constructs during the decade.

NASSCOM has identified five global megatrends to be particularly impactful – Asian Economic Eminence, Mass Urbanization and Hyper-Personalization, Environmental Sustainability Stress, Data-Led Economy and Disrupted Future of Work.



Producer – Consumer prioritization of megatrends¹

Per cent of survey respondents



¹ Based on a survey of Global firms conducted by NASSCOM



- **Asian Economic Eminent** – Home to 90 per cent of “new” middle-class urbanites and yielding 50 per cent of global GDP by 2030, Emerging Asia will become the largest consumption base for digital-native, mobile-first, decisively individualistic consumers, giving it a voice of equity in global economic policies and business strategies. Enterprises will have to re-plan customer strategies with constantly shifting target segments. Both enterprises and governments will need to respond with extreme agility, supported by advanced analytics and intelligence insights



- **Data-Led Economy** – Global data has been doubling every three years and is estimated to reach 175 Zettabytes (ZBs) by 2030. Nearly two-thirds will be machine-to-machine data, more than one-third of which will have instantaneous shelf-life and will need real-time analysis and decision-making at source. Edge IoT and Edge Analytics shall play a major role in saving data transmission, storage, and post-fact analysis costs. The other big segment of data will come from end consumers who will increasingly assume complete control of their personal data, creating new data barter businesses



- **Mass Urbanization and Hyper-Personalization** – Two-thirds of the world population will live in small cities, with population up to 1 million that are estimated to grow faster than the global megacities. Megacities, at their end, will sustain 50 per cent of global GDP within them, each worth USD 3 trillion in size. Urbanization in the next decade will grow faster through physical area agglomeration than growth in its constituent population, creating hyper-local clusters with distinct needs. As a downside, such mass, but disorganized, urbanization will push the environment beyond its stress limits



- **Disrupted Future of Work:** Future of work will be disrupted at the (virtual) workplace with automation and co-working machines doing more for human counterparts, through technology-assisted, skill-based work cultures, and by the diversity of emerging workforce mix with Gen Z constituting nearly 36 per cent of the global workforce. Employees will seek more environmentally conscious initiatives by the enterprises



- **Environmental Sustainability Stress** – Climate change, urbanization, natural resource denigration and shrinking arable land will push more than 3 billion people to the verge of severe food and water scarcity. At their current adherence strictness, most countries could miss their Agenda 2030 UNDP SDG targets, and the ICT industry will become a bigger devourer of energy resources. Technology could, on the other hand, fundamentally lower the sustainability stress, and the cost of doing so, through low-cost, low-compute, decentralized, and real-time processing capabilities

Techade 2020 - Digital Tech Opportunity Areas

While the emerging megatrends will need unprecedented coordination, planning, and execution adeptness from governments, corporates and citizens to manoeuvre, technology will emerge as the fundamental bedrock in orienting the outcomes towards greater good at lesser cost.

Globally, incumbent enterprises alone, aside of digital-native start-ups, will generate technology products and services worth half of global GDP of USD 100 trillion by 2025. Nine digital technology areas will emerge as fastest-growing and highest-impacting, with the combined potential to deliver one-third of the USD 100 trillion.

FOUNDATIONAL TECHNOLOGIES		
	Key components	Impact potential (2020-2030)
 CLOUD COMPUTING	<ul style="list-style-type: none"> • Cloud Management Software • Data Center Hardware • High-Speed Networks • SaaS/PaaS 	<ul style="list-style-type: none"> • USD 6.2 trillion global GDP impact by 2025
 BIG DATA AND ANALYTICS (BDA)	<ul style="list-style-type: none"> • Apps & Infrastructure • Data Analytics – AI-Based & Traditional • BI/ Visualization 	<ul style="list-style-type: none"> • 175 zettabytes of data created, 50 per cent of which will be stored in public cloud
 CYBERSECURITY	<ul style="list-style-type: none"> • Security • Intelligence Detection • Remediation Adaptation • End-User Education 	<ul style="list-style-type: none"> • USD 6 trillion global GDP impact by 2025
ADVANCED TECHNOLOGIES		
	Key components	Impact potential (2020-2030)
 ARTIFICIAL INTELLIGENCE (AI)	<ul style="list-style-type: none"> • AI Algorithms • Machine Learning (ML) • Deep Learning 	<ul style="list-style-type: none"> • USD 6.7 trillion global GDP impact by 2025
 INTERNET OF THINGS (IOT)	<ul style="list-style-type: none"> • Consumer Wearables • Advanced, Low-Cost Sensors • Wireless/NFC Devices 	<ul style="list-style-type: none"> • USD 6.2 trillion global GDP impact by 2025 • >1 trillion IoT things installed
 3D PRINTING	<ul style="list-style-type: none"> • Additive Manufacturing • Rapid Prototyping 	<ul style="list-style-type: none"> • USD 0.6 trillion global GDP impact – 35-60 per cent costs saved per printed product
 ROBOTICS	<ul style="list-style-type: none"> • Robotic Dexterity • Sensors • Distributed Robotics • Robotic Exoskeletons 	<ul style="list-style-type: none"> • USD 4.5 trillion global GDP impact by 2025
 BLOCKCHAIN	<ul style="list-style-type: none"> • Distributed Ledger Technology (DLT) • Cryptocurrencies • DApps 	<ul style="list-style-type: none"> • 10 per cent of global GDP – USD 125 trillion* – stored in blockchains by 2027
 IMMERSIVE MEDIA	<ul style="list-style-type: none"> • Virtual Reality (VR) • Augmented Reality (AR) • Mixed Reality (MR) • Extended Reality (XR) 	<ul style="list-style-type: none"> • USD 1.5 trillion of student debt freed up in the US alone

The nine areas include three foundational technologies – Big Data and Analytics, Cloud Computing, and Cybersecurity – and six advanced technologies – Artificial Intelligence, Internet of Things, 3D Printing, Robotics, Blockchain, and Immersive Media.

These technologies will profoundly impact enterprise, government, and end-consumer segments by enabling new-to-world business opportunities across sectors,

provider-consumer interaction points, and established market segments.

From edge-based infrastructure consuming 50 per cent of new infrastructure spend led by end-point and cloudlet infrastructure, to two-thirds of enterprises building 90 per cent cloud-native applications to support cloud-based AI workloads and AI-powered business models reducing mean-time-to-respond by less than half, optimal value of digital technologies





will emerge from interconnected and interdependent applications.

The coming decade will be that of establishing trust (security), precision (sensor-based), competition from non-traditional players, digital ethics and greater automation. Workplaces will undergo a change as the gig economy creates an on-demand workforce.

India's IT-BPM industry has, over the last decade, built a strong digital foundation from which to leapfrog into the next decade of growth. Players will have to work together with internal and external stakeholders to build cross-functional teams, deeper partnerships, agile ecosystem to fuel innovation, encourage a continuous learning environment and empower lines of business to take decisions.

Outlook 2020-21

The global economy has been going through a slowdown over the past few years. 2020 appears to show initial signs of recovery, with worldwide growth expected at 3.3 per cent in 2020. Despite this, the technology industry is likely to grow 4.5 per cent in 2020 to reach USD 2.5 trillion. Enterprise software is the fastest growing at 10.5 per cent; an additional impetus is coming from the focus on digital technologies, especially analytics and legacy system modernisation.

A survey conducted by NASSCOM, of global firms on both the supply and demand side confirms these trends. Factors driving tech spend are currently more internal focused – improving product offerings and

enhancing productivity & operational efficiencies. While the demand side is focusing on cloud and cybersecurity, for the supply side, the tech priorities are AI/ML and IoT/edge computing.

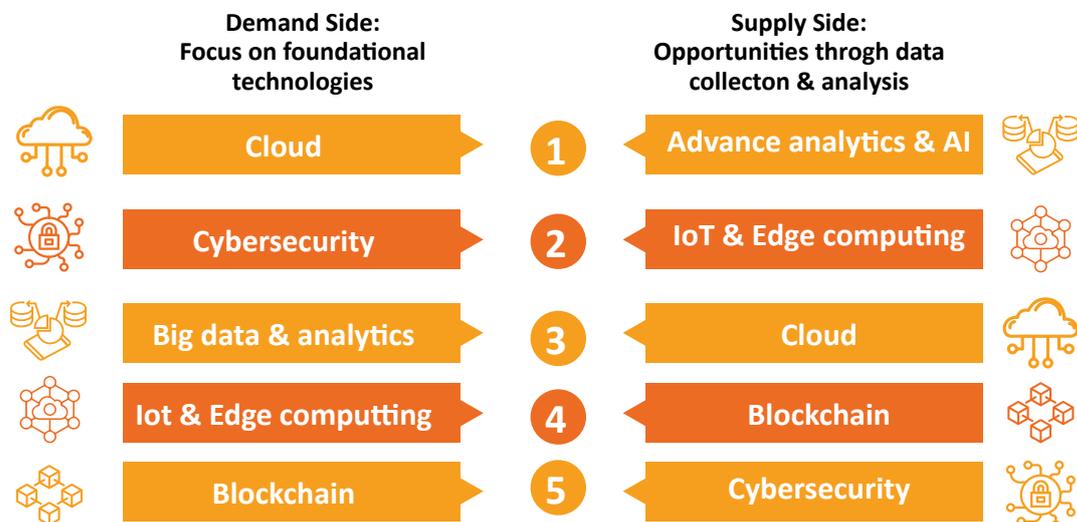
From India's technology providers' perspective:

- IT services being driven by cloud services
- BPM: Higher implementations of chatbots, RPA, AI-based automation
- ER&D: Digital engineering share to increase driven by IoT and Ind 4.0
- Software products: SaaSification and solutions based on Aadhar, GST, databases
- eCommerce: Niche verticals to gain traction- grocery, food, pharmacy, cosmetics, etc.

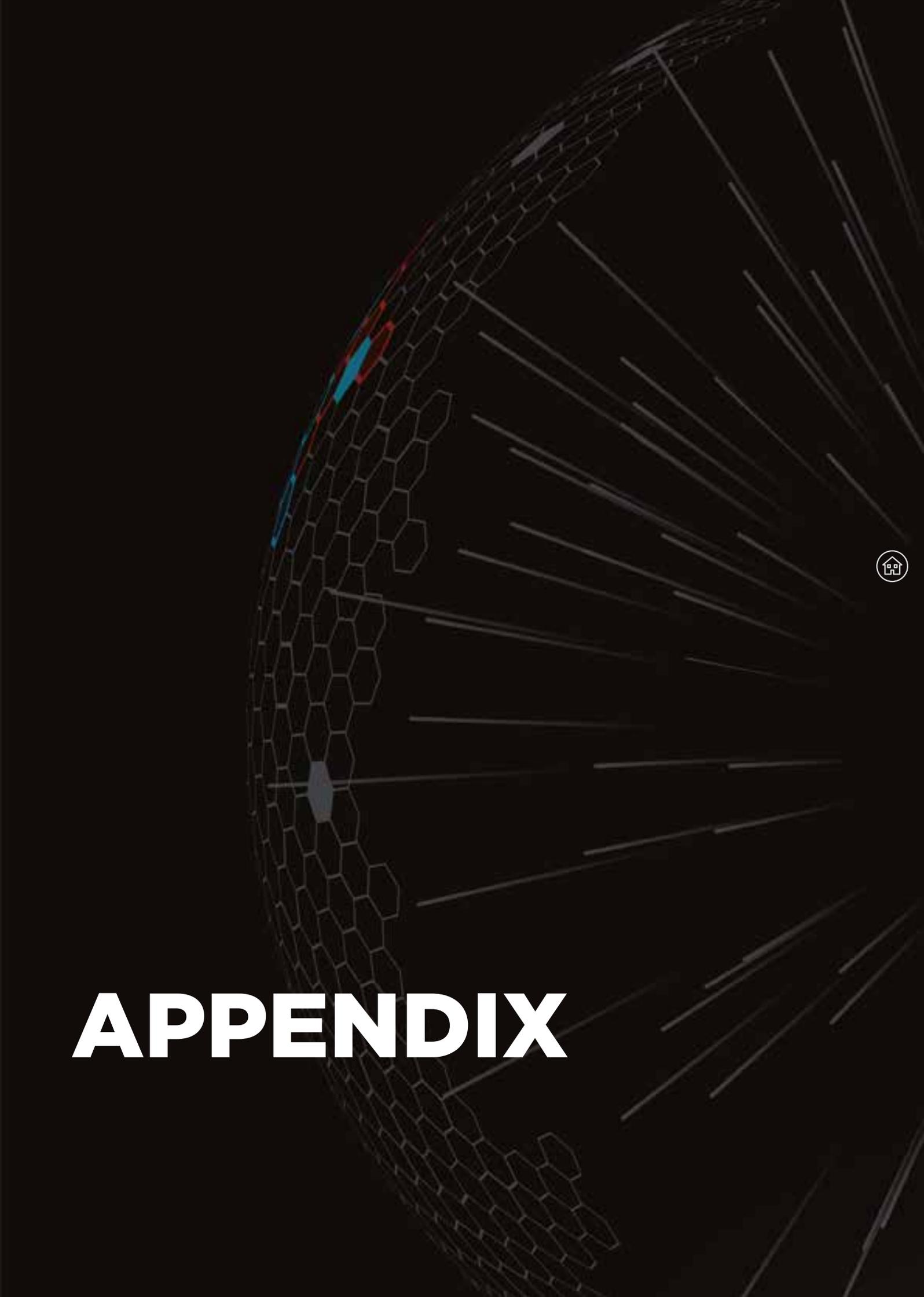
India's uniqueness lies in the fact that it is not only the world's leading provider of technology solutions but it also represents a large consumer base. With the Government of India's target to be a \$ 1 trillion data economy by 2025, stakeholders will need to collaborate to get all the components in place – a robust data strategy that will guide the industry on aspects like data ownership and sharing; cybersecurity policy to make India a trusted partner; talent, for a future-ready workforce; invest in building innovation hubs and business friendly policies.

For the Indian technology industry to be prepared to exploit this opportunity, it will have to focus on its own transformation – this needs to be proactive so that the industry can anticipate future trends and lead the change for itself, its customers and for India.

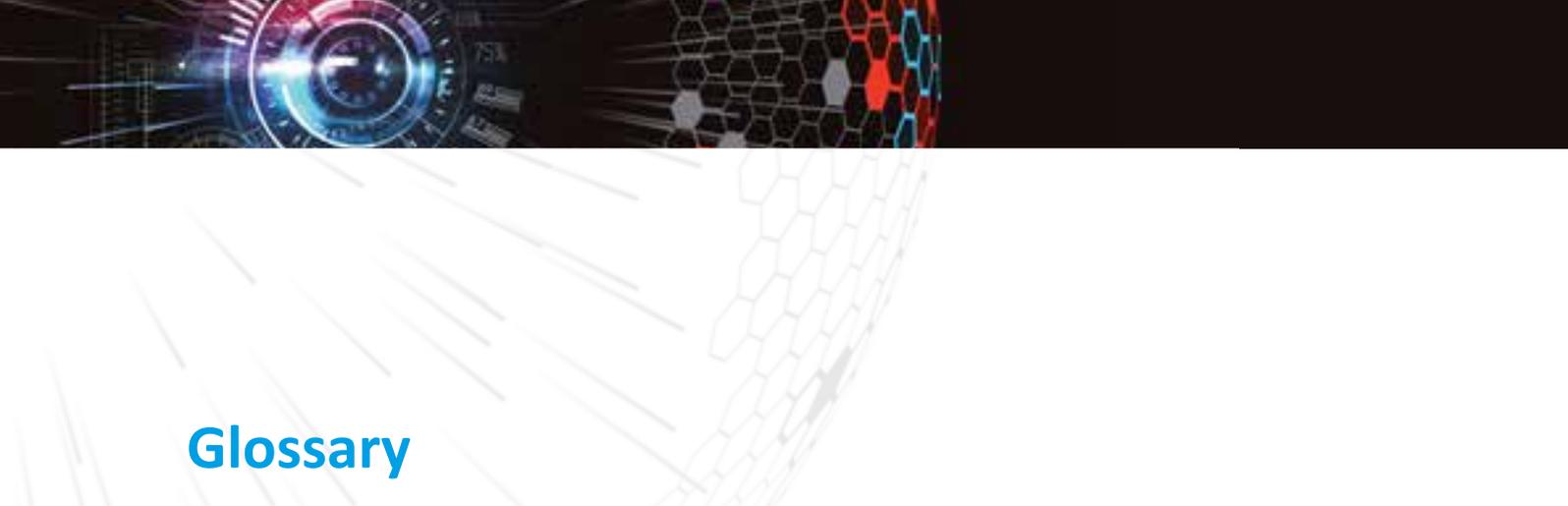
2020 Tech Priorities*



*Based on a survey of Global firms conducted by Nasscom



APPENDIX



Glossary

3D Printing

3D printing is an alternative to traditional product manufacturing wherein the graphical product design data is taken from a CAD/CAM software and input into a 3D printer. The 3D printer segments the product print sequence and then applies the combination of input material to execute a layer-by-layer production. This layer-by-layer production is also called Additive Manufacturing.

Application Programming Interface (API)

API is an independent reprogrammable piece of code that abstracts underlying implementation from the main development layer and acts as a communication interface between the two. Open APIs are publicly available and enable developer access to proprietary software applications or web interfaces.

Artificial Intelligence

Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks.

Artificial Narrow Intelligence (ANI, Machine Learning)

Narrow artificial intelligence focuses on a single subset of cognitive abilities where technology outperforms human capabilities.

Artificial General Intelligence (AGI, Machine Intelligence)

More generalized ability of a machine to understand and learn any intellectual task that a human can.

Artificial Super Intelligence (ASI, Machine Consciousness)

Ability of machines to demonstrate intelligence and cognitive capability beyond the highest human capability.

Augmented Reality (AR)

A technology that superimposes a computer-generated image on a user's view of the real world to enrich the interaction

Automated Machine Learning (AutoML)

AutoML enables ML applications to be used by non-ML experts using methods and processes across proprietary programs.

Big Data

A term that describes the large volume of data – both structured and unstructured – that inundates a business on a day-to-day basis.

Big Data and Analytics (BDA)

Big Data and analytics involves processes, algorithms and visualizations that enable examining large and varied data sets using advanced analytical programs to uncover unknown patterns, correlations and predictions.

Blockchain

A decentralized, consensus-based, tamper-proof data structure, comprised of unchangeable, digitally recorded data in packages called blocks. Each block is then 'chained' to the next block, using a cryptographic signature. This allows block chains to be used like a ledger, which can be shared and accessed by anyone with the appropriate permissions.

Blockchain IoT

Application of blockchain to sending and receiving data from the end-points and devices connected to form the IoT network.

Business Intelligence (BI)

A way to reveal actionable insights in your data.

Business Process as a Service (BPaaS)

A version of software as a service (SaaS) where buyers receive standardised business process services sourced from the cloud by accessing a shared set of resources at each delivery level (people, application, infrastructure) from a single service provider and constructed for multi-tenancy. Services are often automated, and accessed via Internet-based technologies.

Business Process Management (BPM)

Erstwhile BPO; now re-branded as BPM- includes processes that may be IT-enabled, do not necessitate on-shore presence and are hence, offshoreable.

Cloud Computing

The delivery of computing services—servers, storage, databases, networking, software, analytics, intelligence

and more—over the Internet (“the cloud”) to offer faster innovation, flexible resources and economies of scale.

Cloud Infrastructure

Cloud infrastructure is no different from typical data centre infrastructure except that it’s virtualised and offered as a service to be consumed via the Internet. Servers, storage, compute resources and security are all key components of cloud infrastructure.

Cloudlet

Cloudlet is an architectural arrangement arising from the convergence of mobile computing, IoT and cloud computing. It represents a layer within a hierarchy between an IoT end-point device and the cloud computing center/cloud data center. It is conceived as a “data center in a box” that could bring cloud closer to the end-point IoT device.

Cloud Management Platform

Cloud management platforms are integrated products that provide for the management of public, private and hybrid cloud environments.

Cloud Orchestration

Cloud orchestration refers to the arrangement and coordination of automated tasks resulting in a consolidated process or workflow.

Cloud Security

Cloud security is a framework of data, network and information security applied using a broad-encompassing set of policies, technologies and controls that enable at-rest and in-transit security of information assets.

Collaborative Robots (Cobots)

A collaborative robot, also known as a cobot, is a robot that is capable of learning multiple tasks and interact with humans in a shared space or to work in close proximity.

Consortium

A blockchain where the consensus process is controlled by a pre-selected set of nodes. The right to read the blockchain may be public or restricted to the participants.

Containerization

A software programming and packaging technique that combines an application with its configuration files, libraries, and interface objects to create a platform and stack-agnostic application, such as Docker and Kubernetes.

Continuous Intelligence

Continuous intelligence integrates real-time analytics with business operations for processing data to define actions in response to various business events

Conversational Chatbots

Conversational Chatbots are AI agents possessing intelligence and capability for automating conversations at customer-facing touchpoints.

Custom Application Development (CAD)

CAD services focus on delivering customized (to client requirements) development of software applications and interfaces as well as enhancements to existing packaged applications or pre-engineered templates and support and provision of custom applications.

Customer Interaction & Support (CIS)

CIS includes all forms of IT-enabled customer contact; inbound or outbound, voice or non-voice based support used to provide customer services, sales and marketing, technical support and help desk services.

Data Lakes

A data lake is a centralized repository that allows you to store all your structured and unstructured data at any scale.



Decentralized Ledger Technology

A decentralized ledger is a digital logbook that uses some protocol to enable computers in different places to continuously update the shared information store.

Deep Learning

Deep learning is a subset of machine learning that uses multi-layered neural networks to extract higher level features from input data.

DevSecOps

DevSecOps is the development methodology in which security-related tasks are embedded, often in an automated fashion, into the entire cycle of software development oriented along the operational lifecycle.

Digital Contracts

Digital contracts (also known as smart contracts) are self-executing contracts, run on Blockchain, intended to digitally facilitate and verify credible transactions.

Digital Ethics

A practice by which any user of digital technologies, increasingly so related to social media presence, becomes self-aware and an active practitioner of ethics and professionalism in the social.

Digital Forensics

A branch of forensics that applies to recovery and investigation of material or evidence from digital devices, personal or enterprise.



Digital Twins

A digital twin is a digital replica of a living or non-living physical entity.

Distributed Cloud

Distributed clouds are smaller setups of centralized cloud architecture across multiple, distributed locations with the aim to localize subsets of data and analytics, while the governance, overall operations, updates and services reengineering sits at the original site.

eCommerce

Commercial transactions conducted electronically on the Internet by businesses and consumers is called eCommerce. eCommerce is divided into Business to Business (B2B), Business to Consumer (B2C) and Consumer to Consumer (C2C).

Edge Computing

Edge computing enables connected devices to process data closer to where it is created.

Edge AI

Edge AI comprises of AI algorithms that are processed locally on a hardware device, without requiring any connection to generate real-time insights in less than few milliseconds.

Edge Analytics

Edge analytics is an approach to data collection and analysis in which an automated analytical computation is performed on data at a sensor, network switch or other device instead of waiting for the data to be sent back to a centralized data store.

Endpoint Protection

Also called endpoint security, endpoint protection comprises data, network and information security to ensure protection of computer networks with remote connect to client end points.

Engineering Services and Research & Development (ER&D)

Engineering services are those that augment or manage processes that are associated with the creation of a product or service, as well as those associated with maximizing the life span and optimizing the yield associated with a product or asset. This not only includes design elements of the product or service itself, but also encompasses the infrastructure, equipment and processes engaged in manufacturing/ delivering them.

R&D services involve providing research and development for hardware and software technologies, as well as development of software running on embedded systems. This includes computer-aided design (CAD).

- Product Engineering Services (PES)/Offshore Software Product Development (OSPD) Outsourced development of the customer's product, thereby taking up the responsibility of all aspects of the product lifecycle- R&D, prototyping, development, testing, maintenance, support and development of next generation of the products. The development can be outsourced to either a GIC (global in-house captive) or to a third-party vendor.

Going forward, this segment would be clubbed with ER&D and would be referred to as **Product Engineering Services (PES)**.

Extended Reality

Extended reality is an umbrella term comprising of AR, VR and MR. It refers to all real-and-virtual combined environments along with interactions between humans and machines.

Finance & Accounting (F&A)

F&A includes activities such as general accounting, transaction management (account receivables and payables management), corporate finance (e.g. treasury and risk management, and tax management); compliance management and statutory reporting, etc.

Global Capability Centers/Captive units

Captive units include both MNC-owned units that undertake work for the parents' global operations and the company owned units of domestic firms.

Global Sourcing

Services sourced from a country/countries different from the country where the firm receiving the services is located. It includes both offshoring and near-shoring.

Hardware Deployment and Support

The hardware deployment and support service pertains to the installation and support of a specific hardware device. The service is focused on the device and its components rather than on software that is running on the device. Installation activities can include hardware staging and configuration, testing and debugging, site preparation, and physical installation of the device.

Horizontal-specific BPM services

Services that are reasonably similar across industries. Horizontal BPM services include Customer Interaction and Support (CIS), Finance and Accounting (F&A) and other related processing services, Knowledge Services, Human Resource Management (HRM), Procurement BPM, etc.

Human Resource BPM

HR BPM, involves services that are delivered during the initial design and implementation of the solution as well as on a continuous and ongoing process improvement basis. Services such as business consulting, IT consulting, systems integration,



application outsourcing (AO), training and education, and change management are typically involved in HR BPM engagements.

Human Resources Processing

HR processing services includes services that support the core HR activities plus talent management activities and associated business processes such as benefits, payroll and talent management.

Hyperconverged Infrastructure

A form of virtualized infrastructure, hyperconverged infrastructure is defined by software and comprises all infrastructure elements – computing servers, storage, and networking devices – within a single stack.

Hyperscale Computing

It is the system of computing attuned to Big Data and distributed computing where computing power can be quickly scaled based on needs of multiple tenant clients that usually make the case to build a hyperscale computing system.

Infonomics

Study of how economic and asset management principles can be applied to the valuation, handling, and deployment of information assets.

Intelligent Automation

Intelligent automation is a more advanced form of robotic process automation (RPA). It is a combination of robotic automation with one or more AI technologies.

Intelligent Edge

Intelligent Edge is a term describing a process where data is analysed and aggregated in a spot close to where it is captured in a network, has important ramifications for distributed networks including the internet of things (IoT).

Intelligent Mesh

Intelligent digital mesh is the interconnectivity of wearables, mobile devices and IOT sensors that people use to find information or communicate online. The digital mesh refers to the expanded set of endpoints which is used to access applications, gather information or foster human interactions.

Intelligent Robots

A robot that functions as an intelligent machine, that is, it can be programmed to take actions or make choices based on input from sensors.

Initial Coin Offerings (ICOs)

ICOs, or Initial Coin Offerings, are a form of company financing. In most jurisdictions due to regulations these “tokens” don’t represent shares or real economic rights over

the company that issues the ICO. Instead of shares and the shareholders have the option of trading tokens with other users, or using them to pay for services from the issuing entity.

Independent software vendor (ISV)

An ISV makes and sells software products that run on one or more computer hardware or operating system platforms.

Internet of Things (IoT)

A network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.

Industrial IoT

The Industrial Internet of Things refers to interconnected sensors, instruments, and other devices networked together with computers’ industrial applications

Infrastructure Services

It involves a long-term, contractual arrangement in which a service provider takes ownership of and responsibility for managing all or part of a client’s information systems operations or department based on a service level agreement. It usually includes data centre operations and may also include services such as desktop management, local and wide area network operations management, help desk support, application development and maintenance, disaster recovery services and related consulting and systems integration activities.

Infrastructure-as-a-Service (IaaS)

Infrastructure-as-a-service is a cloud deployment strategy that provisions and manages infrastructure for building, running, and maintaining software platforms and services over the network.

IoT Security

IoT security is the technology area concerned with safeguarding connected devices and networks in the internet of things (IoT).

IT Consulting

IT consulting includes IS strategy, IT and network planning, architectural assessments, IS operational analysis, technical system and network designs, product-specific consulting, supplier assessment and maintenance planning.

IT Education and Training

Encompasses education to enhance the knowledge of information technology and expand its use. Training represents training content, delivery solutions, and learning services of IT/technical and desktop applications training delivered to the corporate market by an external provider.





IT Services

IT services involve a full range of engagement types that include consulting, systems integration, IT outsourcing/managed services/hosting services, training, and support/maintenance.

Knowledge Services

It comprises outsourcing of knowledge intensive processes, which includes services such as business research, market research, data management, data analytics, legal and intellectual property services.

Machine Learning

Machine learning refers to ability of computer systems to improve their performance by exposure to data without the need to follow explicitly programmed instructions.

Multi-Cloud

Multi-cloud architecture comprises of heterogenous cloud architectures and distributed cloud assets and software across multiple cloud computing providers such that these can be connected to ensure the most optimal distribution of enterprise workloads.

Natural Language Processing

Natural language processing (NLP) is a branch of artificial intelligence that helps computers understand, interpret and manipulate human language.

Natural Language Query

Natural Language query allows users to get insights by queries written in spoken language without following any specific format or syntax.

Nearshore/Near-site

Country near to client country.

Network Consulting and Integration

Network consulting and integration services are the activities and skills associated with planning for and building data networks. Network consulting services include activities such as operations assessment, network planning and design, capacity planning, and maintenance planning. Network implementation includes services such as installation, configuration, custom software development, testing and debugging, project management, staging, and security implementation activities.

Offshore

The transferring of a complete business process to a different country that is significantly geographically separated from the country or countries where the firm receiving the services is located.

Outsourced/Offshore Software Product Development (OSPD)
SEE Engineering Services and Research & Development (ER&D).

On-site

Client site.

Outsourcing

Outsourcing is a type of engagement, such as consulting and integration that can be sourced from any of the lower-cost regions.

Packaged Software

SEE Software Products.

Platform-as-a-Service (PaaS)

A model to build, run and host applications without having to acquire infrastructure relevant to that specific application, with the metering of IT infrastructure costs based on actual utilization.

Platform-based solutions

Solutions where the software platform is provided (owned or maintained) by the provider.

Product Engineering Services (PES)

SEE Engineering Services and Research & Development (ER&D).

Procurement services

Procurement services are the transfer of ownership of some or all procurement processes or functions to providers. This could include administrative, delivery, or management-related processes or functions.

Robotics

Robotics combines multiple branches of science, engineering, and mathematics to design, create, operate, and utilize machines, or robots, to perform human-completed tasks of varying levels of process and cognitive complexities. It also involves creating computer systems for their control, sensory feedback, and information processing.

Companies and academic institutions experimenting with and commercializing robotic solutions have developed certain robotic operating system (ROS) and ROS-industrial standards for global standardization.

Robotic Process Automation (RPA)

It refers to automation which interacts with a computer centric process through the User Interface (UI) / user objects of the software application supporting that process. A robot is



usually a runtime environment on which different processes/tasks can be executed. RPA can process structured and semi-structured data.

Serverless Cloud

Serverless cloud architecture enables an end-user to build and run applications and flexibly scale utilization without having to acquire or provision infrastructure, operating system, and storage.

Small and Medium Businesses (SMB)

Demand side enterprises with average employees of less than 1,000 who are potential users of IT-BPM services.

Small and Medium Enterprises (SME)

Supply side enterprises that offer IT-BPM services and have annual revenues of less than INR 500 million.

Smart Enterprise

An enterprise configured to deliver maximum strategic and operational value from established and emergent technologies and associated shifts in customer behaviour and competitive landscape. It uses technology to redefine customer experiences, improve operational efficiency, and embed digital advantages throughout its business model.

Software-as-a-Service (SaaS)

A model of software development where an application is hosted as a service provided to customers across the Internet. By eliminating the need to install and run the application on the customer's own computer, it alleviates the customer's burden of software maintenance, ongoing operation and support.

Software Deployment and Support

Software deployment and support services are activities, expertise, and systems providing the customer with proper installation and configuration of all packaged software products as well as appropriate ongoing support, access to resources, and distribution of software product releases, updates, and upgrades.

Software Products (Packaged software)

Packaged software is programs or code sets of any type, commercially available through sale, lease, rental, or as a service. Packaged software revenues typically include fees for initial and continued right-to-use packaged software licenses.

Supervisory Control and Data Acquisition (SCADA)

SCADA systems comprise of hardware and software components used to locally or remotely control operations of a designated nature, with the ability to track, assess, and apply data collected through automated controls for performance monitoring, management, and improvement.

Systems Integration

Systems integration (SI) includes the planning, design, implementation, and project management of a solution that addresses a customer's specific technical or business needs. It involves systems and custom application development, as well as implementation and integration of enterprise package software.

Third-party units

Third-party units are essentially service vendors that are mostly independently owned units (i.e. no single client has a controlling stake in the vendor entity). Third-party vendors also include a small section of MNC-owned independent third-party vendors, such as Cognizant, IBM, Convergys, SITEL, Vertex and Sykes, having a significant part of their global operations based out of India.

Vertical-specific BPM services

Vertical-specific BPM services refer to offerings that require a high degree of vertical specific knowledge that is not easily replicable across industries (e.g. insurance claims processing).

Virtual Reality (VR)

An artificial, computer-generated simulation of a real-life environment or situation that surrounds a user and responds to that individual's actions in a natural way, usually through immersive head-mounted displays and head tracking.



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NASSCOM[®]

Plot 7 to 10, Sector 126, Noida - 201303, India

Phone: 91-120-4990111

Email: research@nasscom.in, Web: www.nasscom.in



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