

#Broadband2022 - Unlocking a trillion dollar digital economy



Confederation of Indian Industry



Building a better
working world

About the report

EY in collaboration with CII, has developed the report – "#Broadband2022 – unlocking a trillion dollar digital economy". The report reflects on the role of broadband connectivity and the multiplier effect it has on the larger ecosystem. India is ripe for a Digital rethink, with both government and industry aligning their efforts toward a broadband powered Digital India.

Broadband has the power to enable the gigabit society that is always connected. Broadband connectivity has changed the way people communicate, socialise, create, sell, shop and work. India's digital consumption patterns highlights the evolution. On an average Indians spend 200 minutes on mobile every day, with the second highest app downloads globally. Almost 79% of the web traffic in India is on mobile.

To realise the Digital India dream, there is a need to strengthen the broadband backbone, which forms a key pillar of this transformation. This report highlights the need for future ready and robust broadband infrastructure and the requisite efforts for expediting its reach.

Further, strengthening India's fibre networks is essential to meet the ever growing data demand. Planning for 5G roll-outs, IoT applications, backhaul upgrades and need to increase fixed broadband access are the drivers behind the fiberization requirement.

Efforts are needed from the government to augment India toward becoming the fibre capital of the world. With the existing push from 'Make in India' program, further efforts can strengthen the case for India moving toward becoming global manufacturing hub for telecom equipment.

Finally, the report emphasises on building an environment that improves the ease of doing business to accentuate the broadband opportunity.

Methodology

The CII Broadband Committee members and EY Subject Matter Resources (SMR) provided key inputs on broadband initiatives and ease of doing business. The inputs have been backed by extensive secondary research, analysis and insights by EY.

Acknowledgements

CII Broadband steering committee members

EY report development team

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Foreword



Chandrajit Banerjee

Director General, CII

India is the second largest telecom market in the world, with over a billion mobile subscribers. The growth in mobile telephony over the last decade, brought in unprecedented opportunities, and reconditioned the way businesses and citizens functioned. India became the poster boy of mobile telephony growth across the globe.

The next wave of this connectivity – high speed broadband – has already set the wheel in motion to further transform India's economy. India is at the cusp of a digital revolution, with high speed broadband serving as a critical pillar. The government's Digital India vision envisages quality broadband for the masses as a basic infrastructure for every citizen.

Broadband has immense potential to augment the economic growth. Apart from the empirical evidences of broadband impacting GDP growth, it also has a cascading positive impact on other infrastructure sectors. Lack of robust infrastructure, has been prohibitive for India's overall economic growth. Broadband powered, digital economy is the new productivity platform that can help India in bridging the infrastructure divide.

High speed broadband has the potential to act as substitute infrastructure for other critical sectors. The cost of high physical infrastructure in sectors such as banking, healthcare, education, governance and retail can be offset by using a digital platform for delivery of services. The ubiquity of the mobile handset, and availability of high speed broadband have the ability to bring the benefits of these critical sectors to the masses.

To realize the Digital India dream, it is pertinent that we work together to strengthen the broadband backbone, for the digital highways to ride on. Currently, several impediments continue to slow down the pace of broadband availability and proliferation to the masses. To accelerate broadband growth, the government and industry need to work in tandem to weed out the challenges. Availability of broadband to the masses would be critical for realizing the fruits of Digital India dream. Also, efforts are required to increase the awareness at the grass root level, around the use cases and benefits of broadband, to realize the true potential of a digitally connected economy.

The EY-CII report on "#Broadband2022 – unlocking a trillion dollar digital economy " is part of CII's overall campaign towards digital transformation. I am sure it will contribute to further growth of the sector.



Kiran Karnik

Chairman - CII National Committee on Telecom and Broadband

India is en-route a digital transformation which cuts across industries and businesses. Enabled by mobile telephony, and the growing pace of broadband access, there has been drastic change in the way services, products and experiences are consumed.

Businesses are no longer the same. Boundaries are blurring and industries are converging. New companies are emerging overnight, even as existing ones work to gain the required agility to compete in today's complex market landscape.

Concepts enabled by internet and connectivity – sharing economy and gig economy – are opening up new opportunities. The internet has connected people and resources which is facilitating the optimum use of idle capacity, both in terms of manpower and resources.

India has marked its place on the world map as a burgeoning start-up incubator. Micro-entrepreneurs are emerging out of the humble mobile platform, assisted by access to broadband access. Broadband is powering start-ups which are challenging the traditional models and bringing in innovative use cases.

The opportunity present is immense, and India needs to capitalize on the growth frontiers opened by this digital revolution. Reliable and scalable broadband deployment will be at the core of this transforming world. Currently we are at a nascent stage, where broadband is available to just 392 million people of the Indian population.

Undeniably, the growth of mobile broadband over the past few years has augmented the pace of growth, but the potential for expansion is immense given that India's broadband penetration rate stands low at 29% of the population.

Further, an impetus on the deployment of next-gen services such as 5G, IoT and AI is coming from both industry and Government. Some of the Indian operators have already conducted 5G trials, while the government has also formed a high-level panel to evaluate and approve the action plan for 5G roll-out by 2020. The need for stronger wireless and wireline networks, will be essential to drive 5G deployment in the country. The success of next generation technologies such as IoT, AI and robotics also hinges on high speed broadband access.

Fast paced and high quality broadband deployment will need policy interventions to iron out the current challenges. Through this report, we aim to highlight the critical issues and concerns to deliberate on, for the government and the industry. We also attempt to bring out the initiatives required to address both supply and demand side factors, to achieve India's ambitious broadband targets.

Foreword



Harish Krishnan

Chairman - CII Broadband Committee and
Managing Director - Public Affairs, Cisco India

India's digital journey is entering its next ambitious phase with the National Digital Communications Policy 2018. With the proposed goals of 'Broadband for All', creation of four million new jobs in the digital communications sector, and increasing its share of GDP to 8% to propel India to the top 50 nations in the ITU ICT Development Index, the government and the industry need to work ever more closely together to fulfil the aspirations of Indian citizens.

Investing in creating future-ready broadband networks will be the key to achieve these impressive objectives. Deploying the best-in-class technology solutions will be essential to make available the economic opportunities to common citizens in a fast, robust, secure, and connected environment. When we connect the unconnected, the possibilities become endless.

According to Cisco visual network index study, video will continue to dominate IP traffic and overall internet traffic growth—representing 80% of all internet traffic by 2021, up from 67% in 2016. Globally, there will be nearly 1.9 billion internet video users (excluding mobile-only) by 2021, up from 1.4 billion in 2016. The world will reach 3 trillion Internet video minutes per month by 2021, which is 5 million years of video per month, or about 1 million video minutes every second.

This trend will be even more accentuated in India and will underline the importance of creating a future proof technology architecture.

On the business side, in an IoT-enabled world, new business models around services will continue to emerge thus strengthening the innovation and start-up ecosystem. Government policies should facilitate these new services and business models. There is a need for the rapid revision and simplification of regulatory requirements and approvals mechanisms. This will help keep pace with the economic rationale as India changes gears and adapts a faster pace in digital revolution.

An extremely essential element for the success of the next digital revolution is building pervasive security throughout the broadband eco-system. A robust collaboration between government and global industry on security will empower Digital India.

I am pleased to share with you this report by CII and EY on #Broadband2022 outlining the opportunities ahead for India and possible strategies to capitalize on them. On behalf of the industry, I would like to extend our full support and commitment to the government for achieving its National Digital Communications Policy goals.



Prashant Singhal

Emerging Markets TMT Leader, EY

Do you remember that before 2007 we did not have smartphones? Ever since, smartphones have become the way of life, connecting one-third of Indians to the power of Internet. Last year 9 out of 10 smartphones sold were 4G capable. Today, India consumes 2,360 petabytes every month, making it the largest data market globally surpassing China, USA and Japan. All of this in a decade is nothing short of phenomenal.

We are at the cusp of transformation and the curve will shift faster. To make internet accessible to 9 out of 10 people by 2022, we will be adding nearly 275 connections every day for next 5 years leading to 5.1x rise in average data consumption on smartphone per user.

Connectivity is bringing businesses together. Against a backdrop of digitalization and hyper-connectivity, disruption creates convergence nodes between previously separate industries. Convergence also creates new markets and opportunities for companies and governments to grow and compete in a connected world.

This evolving business landscape is fostering new horizons. Companies are getting born out of a broadband powered smartphone, and incumbents are rethinking their business models to stay relevant. As 5G and IoT bring in a device controlled world, the need for business model transformation will rise exponentially.

We should aim for a Gigabit society where citizens and businesses benefit from widespread connectivity of fast-broadband, reliable performance delivered by robust, future-proof fixed and mobile technologies.

Digitalization of our country depends upon capacity to deploy right connectivity. We need favourable policy decisions to ensure investment is forthcoming. This can be encouraged by reducing the costs of rolling out fibre networks, where the reuse and sharing of physical infrastructure that supports digital networks has an important role to play. India pioneered the concept of passive infrastructure sharing globally. We can see emergence of innovative models for partnership and fibre infrastructure sharing for broadband as well.

Government initiatives such as BharatNet, Smart Cities and Startup India have set the right foundation. The draft National Digital Communication policy 2018 is a progressive initiative towards embedding broadband in the fabric of India's digital economy.

With the right mix of accelerators - including regulatory frameworks, government incentives and industry collaboration - India can lead the Fourth Industrial revolution. The real opportunity is to look beyond technology, and find ways to give the greatest number of people the ability to positively impact their families, organisations and communities. At the back of this, India has the potential to unlock a trillion dollar digital economy by 2022 and add up to 10 million jobs.

I thank the CII Broadband Committee for their involvement and valuable inputs. I hope this report helps us in shaping the dialogue for accelerating Hon'ble Prime Minister's Digital India vision.



Executive Summary

Globally, there are 7.8 billion mobile subscribers. Nearly 15% of the mobile subscribers are from India. 45% of the 300 million net additions this year, are Indians. In the past 10 years, the wireless network added an average of 3 Indians per second. One third of the population uses mobile for connecting to the internet. Together, we consume over 2,360 Petabytes of data, equivalent to data stored in 526 million DVDs! India is the largest consumer of data globally, surpassing China, USA and Japan. Mobile communication has emerged as a frontrunner in accelerating India's digital transformation. However, over 65% of Indians are still offline, outlining the untapped potential of broadband.

Internet can be termed as world's biggest revolution. Given that recognition of World Wide Web is only 28 years old, it has transformed how people connect, talk, read, write, work, travel, socialize and much more. Broadband is contributing significantly to social and economic development, and plays a fundamental role in accelerating progress towards the United Nations Sustainable Development Goals.

Broadband is the gateway to the digital transformation reshaping a nation's industries, companies and the way people live. The impetus is on connecting the unconnected, improving experience for under-connected moving towards the hyper-connected and emergence of gigabit society.

Broadband for one and all

Broadband has become pervasive – just as water and electricity are to most households today. Finland has become

the first country in the world to make broadband a legal right for every citizen. UK chose to treat modern internet as a utility – giving its citizens "legal right" to fast, reliable connectivity. Similarly, Canada declared 'high-speed' Internet essential to "quality of life".

Mobile broadband is empowering millions of Indians every day, and many continue to join the revolution with a click and a tick. It is empowering a farmer with right information at right time; enabling ways to increase crop yields and get wider access to market produce. A public transit commuter is using GPS enabled app to monitor real time traffic and optimise travel time. A student is amplifying learning through online libraries or applying to distant universities with a tap of a finger. It is enabling people to order groceries or other essentials with a click. Gone are days, when standing in long queues at municipal offices was the only means to pay utility bills. Power of broadband has enabled any member of the family to pay bills, book tickets, order pizza or call a cab within seconds.

Smartphones have dramatically changed consumption patterns, and increasingly, the hunger for these devices show no sign of abating. On an average Indians spend 200 minutes on their smartphone daily. 450 million mobile phone users have smartphones. 38 smartphones were sold every minute past year. Favourable demographics, low data pricing, decline in selling price of smartphones and access to faster mobile broadband have been instrumental in driving availability and accessibility of smartphones to Indians.

Digital is changing life of a common man

Railways (IRCTC)	Transport	Shopping	Financial Services
Online tickets booked 209 million 21.5x surge between 2011-17	Online cab rides completed 480 million 3.4x rise between 2015-17	Online shoppers 90 million 2.3x rise between 2015-17	Volume of M-wallet transactions 21 billion 2.3x rise between 2013-17
300+ Wi-Fi enabled train stations	1 million Employed - 3.3x estimated rise between 2015-17	39 million Users in 2015; representing 2.5% of total retail sales	69% Share of money transfer and bill payments in M-wallet market
On-the-go access for host of e-services: <ul style="list-style-type: none"> ▶ e-rail ticketing ▶ e-air ticketing ▶ e-cabs ▶ e-tourism ▶ e-wallets ▶ e-catering 	More affordable, accessible <ul style="list-style-type: none"> ▶ Dynamic pricing ▶ Wider portfolio of on-demand services ▶ Autos ▶ Bicycles ▶ Eat on the go (food ordering) ▶ Cashless travel 	Customer is the king <ul style="list-style-type: none"> ▶ Ease of 24x7 shopping ▶ Huge discounts ▶ Competitive offers ▶ Ability to choose from millions of products ▶ Time saving door stop delivery and returns ▶ Connecting people to buy/sell used products 	Transition to cash-less economy <ul style="list-style-type: none"> ▶ Water and electricity bills ▶ Mobile recharges ▶ Cab-booking ▶ Online money transfer ▶ Grocery shopping ▶ Movie ticketing ▶ Travel booking ▶ Online trading ▶ Online insurance

Living in a hyper-connected world

Internet connected people to people. Going forward, everything that can be connected, will be connected. The internet-of-things will see connectivity move beyond smartphones and gadgets - to connect billions of devices, vehicles, household appliances, monitors and sensors. Smart and intelligent automation will redefine life in hyper connected world.

Smart grids will improve reach, reliability, security, and resilience; easing the incorporation of renewable energy into the grid; and providing for better energy demand management. Driverless cars will find their way to mass transportation. Intelligent highways and vehicles promise to reduce congestion, reduce accidents, and allow for more capacity out of the roads and highways.

This new system of sensors, networks and M2M is emerging as a major innovation that will be deeply embedded in all aspects of the city, its functions and society at large.

Businesses are adopting M2M to innovate, explore revenue streams, and enhance customer experience. They are integrating M2M as a strategic priority and investing in its potential. Cross industry application is driving new business models and solutions. It is also supporting economic growth at the back of a vibrant start-up culture and creating new jobs and skills.

M2M in India poised for growth

With the current growth momentum, M2M connections are estimated to reach 429 million by 2021 from 87 million in 2016 at a CAGR of 37.6%. In an accelerated growth scenario, M2M has the potential to reach 2 billion connections and revenues of US\$11.1 billion by 2022.

The growth of a connected ecosystem will facilitate the digitization efforts in India. M2M will be an enabler for realizing the #Broadband2022 vision of 100 smart cities.

Future smart cities

Energy	Transportation	Water
<ul style="list-style-type: none"> Smart electricity management Smart power grid Smart metering for electricity and gas Smart gas pipeline management Smart lighting 	<ul style="list-style-type: none"> Smart transportation Route optimization Smart ticketing Smart signage Smart parking Interactive bus stops 	<ul style="list-style-type: none"> Smart water management Smart metering Water leakage detection Smart pipes and sensor networks Smart irrigation management
Building	Waste management	Housing
<ul style="list-style-type: none"> Smart buildings CCTV surveillance 	<ul style="list-style-type: none"> Smart waste management Waste tracking systems 	<ul style="list-style-type: none"> Integrated building management Housing finder Housing plan management and tracker
Safety and security	Health care	Education
<ul style="list-style-type: none"> Smart physical safety and security City surveillance Remote monitoring 	<ul style="list-style-type: none"> Smart health care 	<ul style="list-style-type: none"> Remote education
Entertainment	Environment	Homes and buildings
<ul style="list-style-type: none"> Open public access digitally 	<ul style="list-style-type: none"> Smart lighting Smart irrigation management 	<ul style="list-style-type: none"> Controlling appliances remotely Home security, climate control and lighting
Service delivery	Transparency and accountability	Citizen participation and advisory
Smart digital transactions	Models, optimization, and decision-support tools	<ul style="list-style-type: none"> Citizens interface to policy Direct voting

Mobile broadband will be key to providing a backbone for increased network coverage and data speeds. The National Digital Communications Policy 2018 (draft) lays thrust on driving M2M growth in India. A robust broadband infrastructure to provide seamless backbone connectivity will be critical to unleash M2M potential in India.

M2M – to impact people, businesses and governments



Delivering the digital infrastructure for #Broadband2022

A hyper connected ecosystem will multiply data consumption. Developing the best-in class broadband infrastructure for catering to the Gigabit society is instrumental to India's digital transformation. In essence, there is need for a combination of fiber and wireless technology to meet the needs of #Broadband2022.

Currently, fixed broadband has a minuscule play in India's broadband consumption. Government is driving fiber rural connectivity agenda through BharatNet and GramNet. However, play of private players is still limited due to lack of monetization models and financially viable business case.

Global trends suggest, there is a direct link between fiber consumption with evolution of technologies. A study noted that the capita expenditure spent by top 15 telcos globally rose 1.6x during 2011-17 (period of 3G to 4G transition), while OFC consumption grew 3x faster; establishing the role of fiber in supporting the digital economy imperatives.

Fixed Broadband constitutes only 5% of India's broadband market	Play of FTTH is limited with only 0.5% penetration; behind Singapore 95% and Hong Kong 71%	India's fiber per capita (fKm) is 0.1x; behind China at 0.9x and USA 1.4x
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Strengthening backhaul and FTTx for a fiber rich diet

With 4G on rise and 5G on the anvil, microwave-based backhaul will become less effective. Nearly 70% of the India's towers will need to be fiberized by 2020 from the current levels of sub-25% as a part of building Infrastructure 2.0.

Fiberizing 70% of the towers will require an estimated 600,000 fKm, at an investment of \$8 billion

Telcos will have to add more fibre to their networks to fully monetize the spectrum purchased in last 2 years. In India, FTTH model is expensive compared to other countries due to high ROW cost. Initial investments are likely to be high, but rewards are considerable and include new revenue streams such as residential broadband and enterprise services. Evidence further support that fiber costs rationalize with increase in household penetration.

Unleashing the full potential will hinge on innovative business models for fiber deployment. The DoT's amendment of unified

license scheme for active infrastructure sharing and the revised public private partnership (PPP) model for BharatNet projects were timely steps to boost the infrastructure sharing efforts by operators. Having pioneered the concept of passive infrastructure sharing globally, India is expected to lead the gigabit era with innovative asset-light models. Common or shared fibre networks, is one such approach. It will not only lead to significant capex and opex saving, but also reduce deployment time. Relevant considerations need to be addressed in UASL/IP-1 licenses.

From sustainability to inclusive growth

There is a latent domestic demand of fiber and fiber cables to cater to the boom in broadband infrastructure requirements. In order to meet the rising demand, the country needs to increase domestic manufacturing. As a result economies of scale will come in to play making domestic manufactures competitive for global markets – propelling India to be the fibre capital of the world.

In India, during 2015-17:

- Optical fiber – higher growth in domestic consumption at 16.7% compared to shipments at 12.8%
- Optical fiber cable – higher growth in shipments at 16.9% compared to the demand at 12.6%

From 'Make in India' to 'Made in India'

The endeavour of #Broadband2022 is to progress from being self-sufficient to self-sustainable. India is highly import reliant for telecoms equipment. From 2012-16, import bill has increased at a rate of 16.3% annually while the exports have declined at an annual rate of 17.9%.

Policy initiatives for strengthening local manufacturing can help reversing the trade mix. For instance, recent mandates on device specifications can cause the price of entry-level phones to increase by US\$3, and as a result, an additional 13 million people would not be able to afford mobile broadband. Efforts need to be directed toward boosting domestic manufacturing and gradually increasing exports to make India a global telecom equipment manufacturing destination. Handsets, routers and modems are fundamental to network connectivity and their local production should be encouraged to provide opportunities for growth.

Ease of Doing #Broadband2022

The explosion of data and ideas enabled by digital technology is creating more complexity. As convergence accelerates and complexity grows, the need for collaboration – and simplicity – is crucial to lasting success.

According fibre the status of essential utility should be an imperative. There is need for a 'Fiber first' policy and centrally held guidelines to ensure deployment of high-quality fiber networks across the nation. Adoption of 'Dig once' and 'Dig safe' policies can will be effective to prevent damage of fiber cuts. Other infrastructure providers such as like power, water, gas can be also be incentivised to include ducts and optical fiber networks as part of the new infrastructure. The payment process of public projects must be streamlined for cash flow predictability. A future ready fibre rollout would require consideration towards Incentivizing deployment of higher count fiber to ensure building codes have fiber for smart buildings.

It is important to simplify Right-of-way policy and have a single window clearance, through centre and states. Central or state level agencies and task force can be set up to oversee the implementation of RoW rules. Single window clearance for payments should be encouraged, under RoW policy to encourage faster rollouts of new towers and deployment of Fiber-to-the-tower.

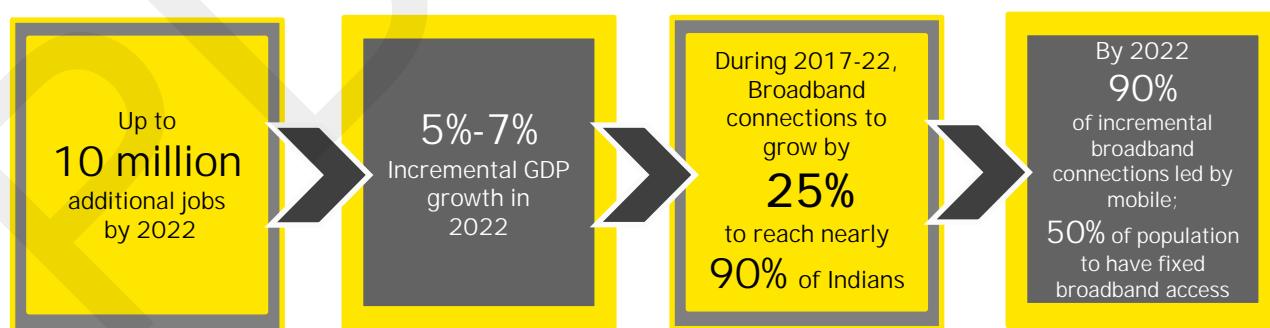
Considerations should be made towards dedicating higher annual higher spending on ICT sector, given the opportunity it provides for other sectors to grow. Developing a government-led 'Telecom Infrastructure fund' in which various ministries (education, healthcare, banking) contribute a percentage of budget for availing broadband infrastructure, will support delivery of new-age services.

Making Telecom Equipment Manufacturing policy an integral part of the digital communications policy will be critical in advancing the export agenda. Rationalising taxes, levies and differential duties to incentivize domestic manufacturing of telecom equipment to the extent of domestic value addition should be considered.

Taken together, progressive reforms in broader telecoms sector can support acceleration and attract investments to the tune of \$100b by 2020.

Connect. Collaborate. Converge.

A focused approach toward #Broadband2022 will require government, regulators and industry to connect, collaborate and converge for building a sustainable digital economy. With all elements in place, #Broadband2022 has the potential to unlock a trillion dollar digital economy

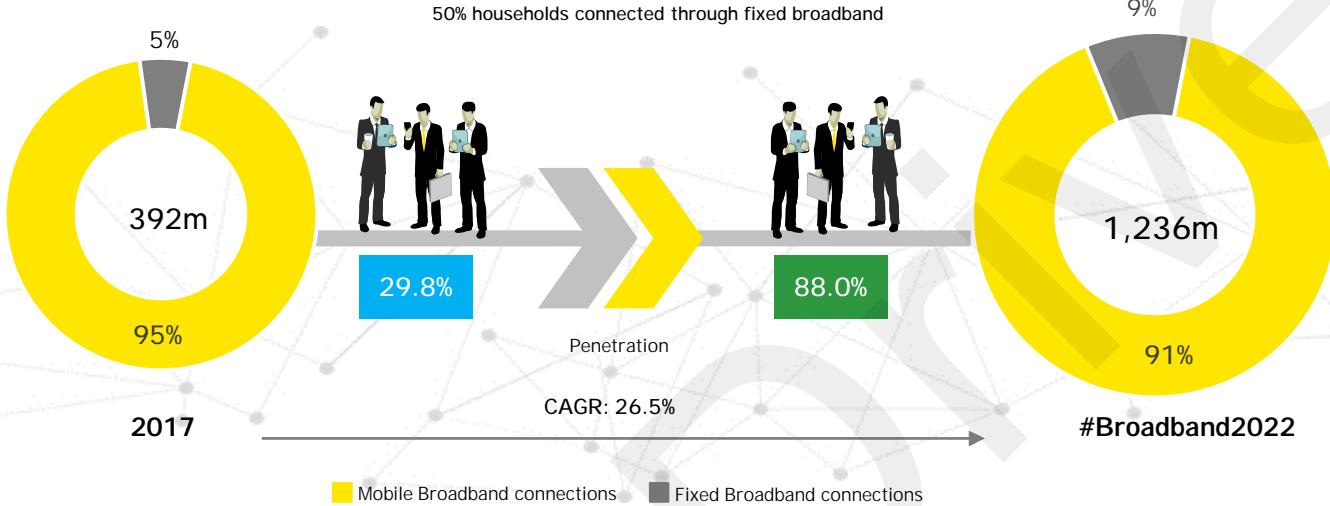


#Broadband2022

Broadband connections to grow 3.1x, accelerating penetration to 88% of population

During the period, 4.8 mobile connections will be added per second

50% households connected through fixed broadband



2.5x rise in broadband revenues

CAGR: 20.6%

Draft National Digital Communication Policy 2018



Universal Broadband coverage to every citizen



Connectivity to Gram Panchayats by 2022; 1 Gbps by 2020



Broadband on demand to key development institutions, including education

US\$800 billion to US\$1 trillion

digital economy by 2022

5%-7%

incremental GDP growth in 2022



Generating
up to 10m

employment opportunities by 2022

Mobile economy to thrive on massive rise in data consumption

2.2x rise in
smartphone users

650m

5.1x rise in average data
on smartphone

18GB

2.2x rise in applications
downloaded

44.5m

#Broadband2022

Largest online video users globally

500m

2x rise

Video consumption to account for

3/4th

Of the total mobile traffic



10 million

Public WiFi spots by 2022;
Deploy 5 million by 2020



65

Unique subscriber
density by 2022;
achieve 55 by 2020



50%

Fixed line broadband
access to households
enabled by 2022

Digital Broadband Mission for 2022

Envisaging

#Broadband2022

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Can tackling digital
exclusion address
inequality?

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Will digital help us do
less or become more?

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Is on-demand the
new in-demand?

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Inclusive growth.
Down to government
or up to business?

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Can local
manufacturing power
exports?

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How can you aspire to
lead in the digital
economy?

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01

Can tackling
digital exclusion
address
inequality?

Beyond connectivity

The internet is the decisive technology of the Information age and is bringing about a revolution. The internet continues to shape human interaction, information sharing, commerce and governance. The world is now a global city and connectivity is the force behind it. With the power of internet and smartphones, one can now connect with anyone, at anytime and anywhere. Technological innovation and broadband connectivity has always been considered a major stimulus for economic growth. The impact on society continues to be far reaching at multiple levels.

Change, going forward, will continue to be very rapid.

The future: More digital and hyper-connected

The world is fast-moving towards becoming a consumer driven highly dependent on mobile. Connectivity is core for everyone, from yesterday's telephone to today's digital tools that simplify lives. Just like running water or electricity, connectivity over a digital network is now essential and contributes to the collective interest of humankind.

Rapid technology shifts are closing the degrees of separation among disparate industries. It is leading to the blurring of industry walls. Technology, media and telecommunications are amongst the first to be impacted today by the convergence of industries. This convergence is constantly redefining the opportunity matrix across sectors including banking, insurance, healthcare, automotive, power and utilities and education, amongst others.



The global digital economy is worth **US\$11.5 trillion**, equivalent to **15.5%** of the global GDP.

The digital economy has grown **2.5x faster** than the global GDP, almost **doubling in size¹** between 2000 - 2016.

Snapshot of global digital economy on the rise²

6.7x	Digital vs Non Digital ROI	20x	Over the past three decades, US\$1 investment in digital has led US\$20 rise in GDP	2x	India's share in digital economy doubled to 2%, China's grew 3.2x from 4% to ~13% (2000-2016)
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¹ Digital Spillover: Measuring the true impact of the digital economy, Huawei and Oxford Economics, 2017
² Ibid

Broadband: Anchoring the digital domino

A decade ago, nearly one-fifth of the global population had internet access. Today, 3.5 billion or half of global population is connected through internet globally. 80% of the youth population (15-24 years) is online worldwide. It is clear that the youth are at the forefront of internet adoption.

In 2017, there were nearly 7.8 billion mobile subscribers – driving the global mobile penetration to 103%³. 67% of total mobile subscribers were connected to mobile broadband, which grew 15x faster than fixed broadband during the period.

Developing economies are emerging as the growth nuclei of mobile broadband. Mobile penetration is on the rise, and the costs of access is decreasing, enabling more people to pick mobile broadband as their first—and often preferred means of going online. For instance, in emerging economies, mobile broadband as a proportion of total internet subscribers is above 80% in countries like India at 95.4%, Indonesia at 98.4%, Brazil at 89.4% and China at 77.8%.

The transition from voice to data marked a major milestone in mobile economy. The transition from ‘bits to bytes’ is evident with the seismic changes in demand and consumption of data. Average mobile data traffic grew 65% YoY in 3Q17⁴ to reach 14EB/month. Further, it is anticipated that total mobile data traffic for all devices will increase by almost 8x to reach 110EB per month from 2017 - 2023⁵. Going forward, emerging technologies of 5G, Augmented Reality (AR), Virtual Reality (VR) and Internet of things (IoT) are set to redefine the landscape.

Interestingly, smartphone adoption has emerged as a revolution in itself. At close to 85%, data traffic generated by smartphones is already accounting for the largest proportion of mobile data traffic.⁶ To this extent, smartphone is driving demand and emerging as the biggest platform for delivery of content and services. Sharing photos and videos on the go is a daily routine, as is tweeting, pinning, and posting. Of Facebook's 1.45 billion active daily users in 1Q18⁷, nearly 66% were mobile users. Going forward, smartphone data traffic is expected to increase by 9x during the forecast period to account for close to 95% of total mobile data traffic by the end of 2023.

Mobile is also fuelling growth in the wider digital ecosystem. Mobile broadband users are direct addressable markets for many sectors such as e-commerce, banking and insurance, healthcare, and education amongst others. In addition, with convergence blurring industry boundaries, broadband both wireless and fixed – is the cornerstone for the delivery of next generation services and content. Emerging business models that embrace new patterns of consumption enabled by disruptive technologies can further stimulate growth and jobs.

While significant progress has been made on connectivity, challenges continue to inhibit the growth of mobile broadband. Over 50% of the global population is offline, with the people in the top 5 offline countries represent 56% of the total pie.

Network coverage is an area of concern. Facebook's recent study of 75 countries revealed that on average 94% of the population live within range of a 2G mobile signal. In contrast, only 76% of the world's population within access of a 3G signal, and only 43% of people have access to a 4G connection. Addressing these challenges will be critical to power growth in a digital age.

Alongside the march toward universal access for broadband, there is also an emergence of “Gigabit society”. To realize the idea of Gigabit societies, it is imperative to fully adopt high speed fiber and replace copper and other legacy connections as means of delivering fixed network coverage. The next generation of connectivity will bring together fixed and mobile networks to deliver high-capacity and smart networks.

³ Ericsson Mobility Report 2017

⁴ ibid

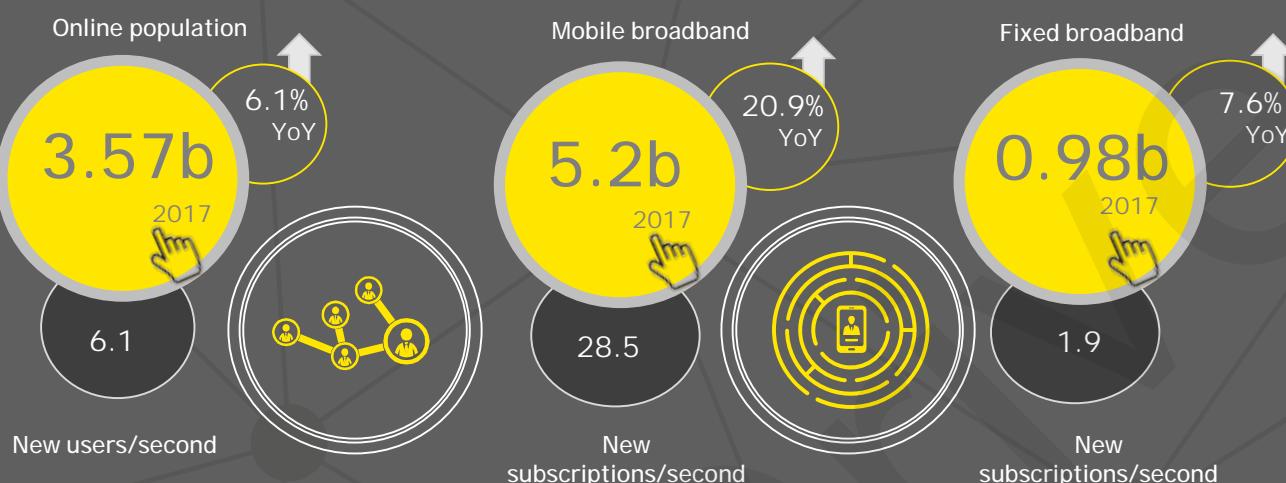
⁵ ibid

⁶ ibid

⁷ Media articles

Today, nearly half of the global population is online

Mobile broadband has seen immense growth



Mobile emerging as the 'first-screen' for broadband experience

Mobile industry contribution to GDP



84% of the world population now covered by a mobile broadband network

Paradigm shift in usage patterns

3/4th of people with mobile already use it for the internet

More than 50% of search queries globally come from mobile devices

Mobile apps account for 70% of time spent on social media networks

1 in 4 users now spend more than 7 hours every day on their smartphone

Globally, people now use an average of 2.5 connected devices per adult

Nearly 75% of smartphone users globally watch online videos on their phone

Accelerating transition from 'voice to data'

7.8b

Mobile subscriptions
3Q17

4.0%
YoY%

2.4b

4G subscriptions
2017

29.6%
YoY%

14EB

Total mobile data
traffic
3Q17

65.0%
YoY%

China and India represented
75% of total net adds
300m during the year

4G accounted for 31% of
total mobile subscriptions;
up from 25% in 2016

Video accounted for 55%
of total traffic; followed by
Social networking

4.3b

Smartphone
connections
2017

16.4%
YOY

250m

Videos viewed online
in 2017

64%
YOY

7.2 Mbps

Global Average
connection speed
4Q17

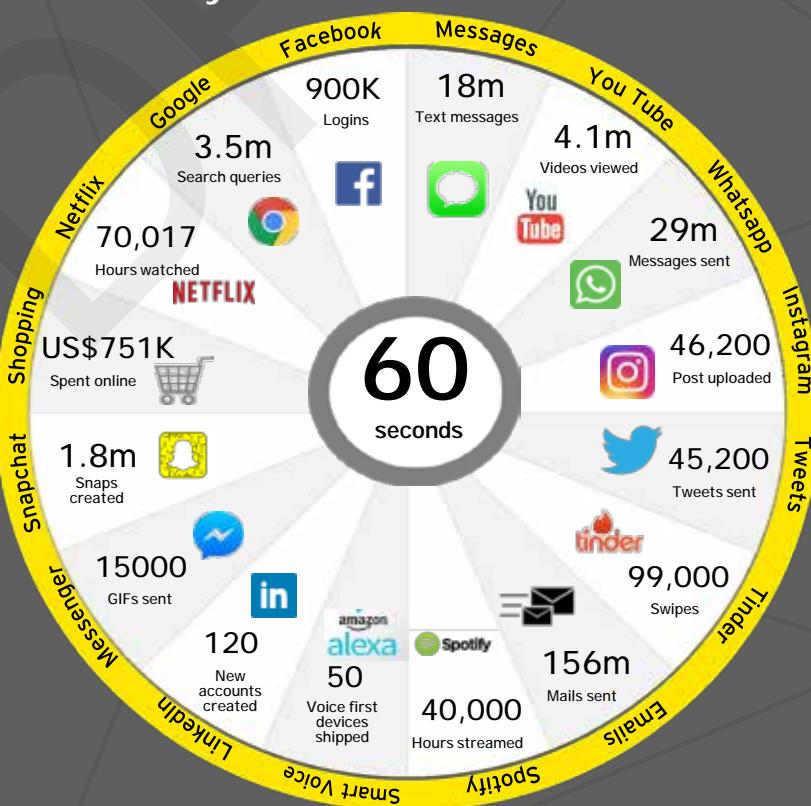
15.0%
YOY

China being the largest
with ~23% share;
followed by India 10.8%

93% of the time spent on
videos were those in Hindi and
other regional languages

South Korea highest average
speed at 28.6 Mbps;
Philippines lowest at 5.5
Mbps.

Every 60 seconds on the internet

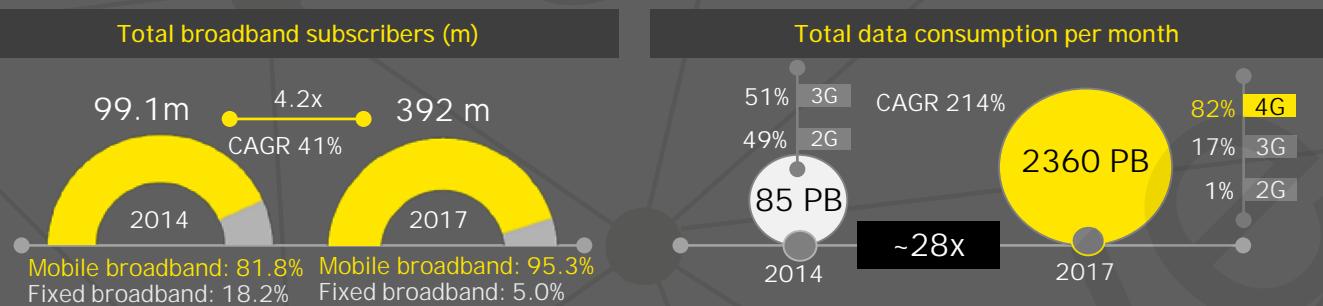


Sources: ITU, Ericsson Mobility,
Inclusive Internet Index 2018

*Rank basis data for 70 countries

Wheel created by Lori Lewis and Chadd Callahan of Cumulus Media

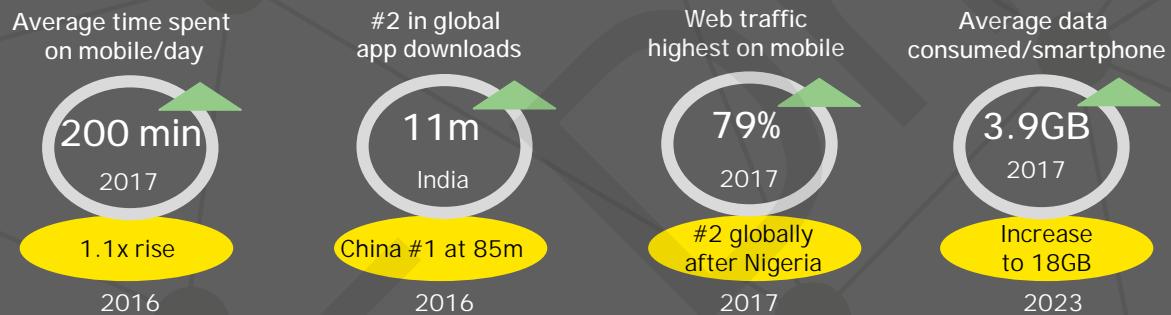
In India, 95% broadband users on mobile; 865m remain offline



95% of the broadband subscriber additions (2014-18) were on Mobile

#1 India is the largest data consumer globally surpassing China, USA and Japan

Evolving consumption patterns driven by high demand for data services



Favourable market dynamics stimulating demand and usage

Availability and affordability of smartphones

#2 smartphone market globally
124m 14% YoY
Shipments - 2017

Driven by entry of low-end phones for targeting offline market

Progressing with 'Make in India'
225m
3.8x rise in smartphones manufacturing;
Nearly 115 new manufacturing units set-up in 3 years

Fall in average selling price of smartphones
US\$115
45% CAGR (ASP in 2017)
Steep decline vis-à-vis global peers - Brazil and Indonesia at 36% each

Steep decline in data tariffs

Data tariffs declined 97% in a year

drastic cut in data prices has been driving a sharp increase in volumes

4G wave driving growth

2017 (GB/user/month)	Growth (2016-17)
4G 11.0	7.8x
3G 3.0	3.5x
2G 0.3	1.2x

Mission critical to address challenges for unleashing the broadband potential

Lack of internet experience with **low average mobile broadband speed** of 8.8Mbps; China has 31.2Mbps, while Norway has 62.6 Mbps

Lack of **digital literacy**, awareness of new technologies is inhibiting uptake

6 years after 4G commercial launch, ~**73% population has 4G coverage** against 93% of 2G

India has the lowest **fiber km per capita** at 0.09 Vvis-a-vis global peers - Japan 1.35; USA 1.34; and China 0.87

Lack of infrastructure financing impacts deployment - telecoms in total infra bad loans stands was **8.7% in FY17**; up from 5% in FY16

02

Will digital help us
do less or become
more?

Is every industry now your industry?

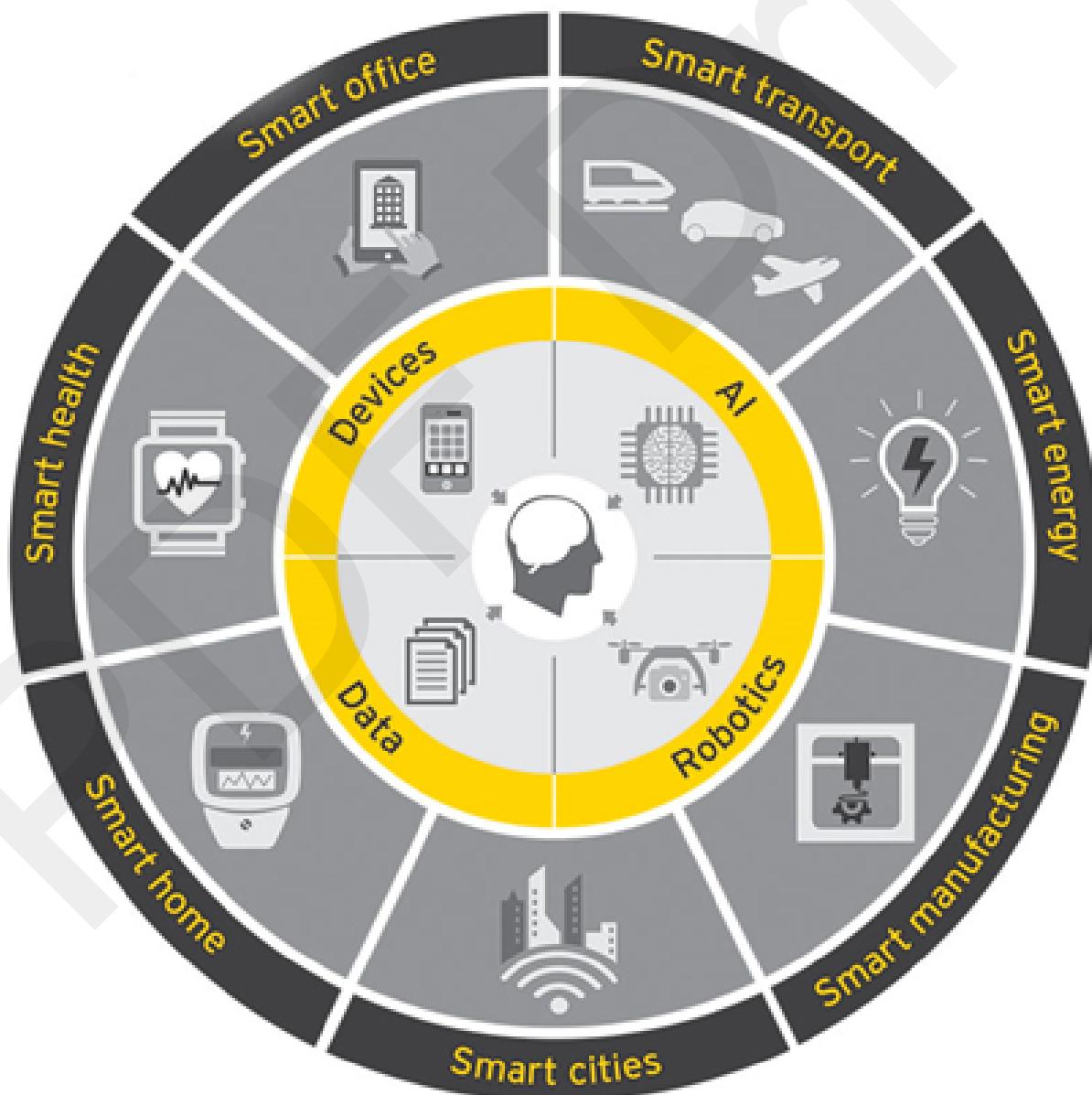
Digital is dramatically altering the industry basics and convergence is disrupting industry spaces and uprooting incumbents. The rise of digital is transforming value chain to a point where every company is a technology company and every business is a consumer business.

Digital platforms are displacing physical world ecosystems. From start-ups to traditional titans, there is a 360 degree change in competitive dynamics. Today, an online cab aggregator has disrupted the taxi industry, and could do the same for food delivery industry. As a result, customers are

more empowered and demand innovative offerings. The digital consumers have a powerful voice and are taking more informed decisions for greater choice between providers.

Adoption in new technologies of Big Data Analytics, artificial intelligence (AI) and robotics, together with connectivity enabled by the IoT, is set to dramatically change the way we work and live. This paradigm shift is a result of massive growth in wireless connectivity that is driving directional changes in the concept of standalone industries.

The world is getting smart



How can a connection today define your tomorrow?

Empowering agriculture: from 'small farms' to 'smart farms'

Challenges

- Negative impact of intense agriculture on soil fertility, crop yield, pest infestation
- Agrochemical residues in food
- Natural calamities impacting yield
- Lack of storage
- Limited awareness on new age farming techniques for irrigation and crop monitoring
- Financial insecurities of disbursement

91%

Water withdrawal due to agriculture practices; against 70% globally

45%

Net area irrigated on 104m Hectare of net cultivated land



US\$13b

Harvest and post harvest loss of India's major agriculture produce (2016)

17%-18%

Contribution of Agriculture sector to GDP (2018)

58%

Of rural households depend on it as source of livelihood (2016)

#Broadband2022

- Precision agriculture for highly optimized, individualized, real time, hyper-connected and data driven
- Global Positioning Systems (GPS) for yield monitors, soil sampling
- Unmanned aerial vehicles, auto-steered and guided equipment
- Visual Recognition tools to identify diseases, pest attacks or weather impacts
- IoT and smart sensors to monitor soil moisture, nutrient levels, temperature of produce in storage and status of equipment

E-NAM

585 agriculture produce markets unfired under Digital India; 6.6m registered farmers

40

Out of 280 IoT based startups focus on smart agriculture (2017)



20%-30%

improve the yield of major broad-acre crops using digital platforms for end-to-end service to farmers

Empowering energy: 'From 'energy saved' to 'energy earned'

Challenges

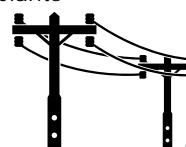
- Shortage of coal driving rise in power tariffs resulting from higher spot prices at energy exchanges
- Lack of alternative sources of non-renewable energy
- Lack of rural electrification
- Low plant efficiency resulting in increased use of coal and CO2 emissions
- High maintenance cost of thermal power plants

16%

Low efficiencies of some of the coal-based power plants

32m

Rural households in dark due to lack of electrification



120%

More CO2 emissions than European countries by some power plants in India

<8%

Of newly electrified villages had all homes electrified

#Broadband2022

- Digital grid for connecting generation and consumption, and enabling the multidirectional flows of energy and information
- Improved optimization via smart metering for real time insights on energy consumption
- New digital capabilities using big data analytics for balancing the fuel mix, expediting adoption of renewables
- Optimized plant operation using analytics to reduce cost and emissions
- Energy storage technology for alternatives to construction of additional generation and grid capacity

14

Launch of smart grid mission with 1 DISCOMS as a pilot under Digital India

35m

Planned roll out of smart meters by 2019 by the Government

US\$18b

Approved for 2 smart grid projects in Chandigarh and Amravati with 30% funding from Government (2016)

>90%

Government's allocation on development of smart grid in smart cities

Source: Media articles, IBEF

Empowering education: from 'black boards' to 'digital boards'

Challenges

- Low quality and access to education
- High costs of delivery in rural
- Infrastructure inequalities
- Unavailability of teachers
- High drop out rates in primary and secondary rural schools

23:1

Student teacher ratio (2015-16)



60%

Students upto 10 years lack reading skills

50%

Drop out ratio by the age of 15 years

Boys

17.21

Girls

16.88

Secondary school drop out rates (per 100)

47%

Grade 5 children could read Grade 2 textbook

#Broadband2022

- Improve digital literacy through use of ed-tech tools in remote areas
- e-Kranti for connecting all schools with broadband AI enabled visual and dynamic learning channels and study programs
- Interactive websites, chat rooms, web based courses and online libraries
- Video conferencing to compliment face to face learning
- Student education profile data base

#3

India to be top buying country for mobile learning by 2019

US\$100m

Planned investment by a global major's education and e-learning initiative in India

29

Education sector companies launched by Unltd India, a foundation for social entrepreneurs

US\$50m

Recent Investment by an education technology startup for online education in India

Source: Huawei, Media articles

Empowering health: from 'reactive' to 'preventive' healthcare

Challenges

- Lack of infrastructure compared to demand
- Rise in communicable and non-communicable diseases
- Rural under served; concentration of healthcare professionals in urban
- Low medical insurance penetration and inadequate public sector investment
- Inconsistent quality; weak channels of distribution of medicines and vaccines
- Patient medical history management

50%

Deaths in 2015 due to rise in 'dual disease burden' in India



63%

Concentration of hospital beds in India's private sectors

0.62/1000

India low on Doctor population ratio; China at 1.49; US 2.5 per 1000

81.6%

Shortage of specialists in rural community health centers (CHC)

74%

Indian doctors cater to 1/3rd of urban population

#Broadband2022

- Virtual Health Assistants (VHA's) to bridge doctor population challenge
- Healthcare bots, AI aided medical imaging to track progression and treat diseases
- Wearable devices to gather real time health data
- Telemedicine apps for real time clinical support to distant patients
- Remote monitoring for post operative care
- Digital records to reduce cost and improve patient outcomes
- Automated in-patient care for e-learning and simulated programs to shrink training time for nurses
- Health insurers leverage predictive behavioral analytics for risk mitigation and frauds

US\$1b

2.3x growth in M-health market by 2020; up from US\$416m in 2015

172

E-hospitals covered under Digital India's Health management information system

US\$332m

Funding raised by Healthcare startups in 2017; 3x the amount raised in 2016

>60%

Health tech-focussed start-ups incorporated since 2010

Source: Media articles, IBEF, NASSCOM

Empowering infrastructure: from 'concrete cities' to 'smart cities'

Challenges

- High rate of urbanization and lack of supportive infrastructure
- Modernising connect services such as parking, waste management, energy management, water supply
- Poor pre-contraction planning
- High levels of pollution and poor air quality

74%

Houses are served by piped water in India



30%

Cities have sewage treatment against desired 100%

US\$10b

Time and fuel cost due to traffic congestion in India

404m

People will move to cities by 2050; equaling population of Sao Paulo

6%

Urban population defecates in the open

#Broadband2022

- Smart metering and use of data analytics to manage energy and water; dynamic pricing based on usage
- Zero emission vehicles-e rickshaws and e-autos
- Efficient waste management through the use of sensors and network technologies
- Remote street monitoring using AR/VR for real-time insights on traffic, transportation, restaurants, and events
- Reduced energy costs via smart systems that manage heating, cooling, and lighting

US\$31b

Union Budget outlay for 99 Smart Cities identified

10%-12%

Rise in real estate's contribution to the GDP post implementation of smart cities by 2022

10%-15%

Rise in employment opportunities from Smart Cities initiatives



Source: Media articles, Cisco

Empowering governance: from 'exclusion' to 'i-inclusion'

Challenges

- Existence of bureaucracy and red tapism impacting timeliness of administrative responses
- Digital divide and lack of connectivity to remote locations
- Lack of awareness on benefits of e-governance
- Security imperatives to ensure secure online transactions and safety of personal data

14.9

Rural Internet Subscribers per 100 population; 5x lower than urban at 76.8

40%

Of total grains intended for poor actually reach them



54%

India's population experienced bribe for accessing public services

41.4%

people engaged in organised sector employment file returns

#Broadband2022

- Telecentres-enabling access to better information
- Computerised records for PAN, identification, land reforms-Government direct services
- Real tie update to farmers on selection of right agri-inputs, monitoring the soil moisture, controlling irrigation
- Government established real-time online marketplace for public procurement
- Empowering farmers to sell his produce via e-agriculture mandi
- Analytics and data mining to detect tax evasion

50,000

People per day are catered via digitalizing passports

840m

Transactions on government's e-taal - e-governance platform in 2017; 2.8x rise since 2016

1.2b

Adhaar registrations in Feb-18; 1.9x rise since 2014

100,000

Gram panchayats connected via BharatNet; target to connect 250,000

480m

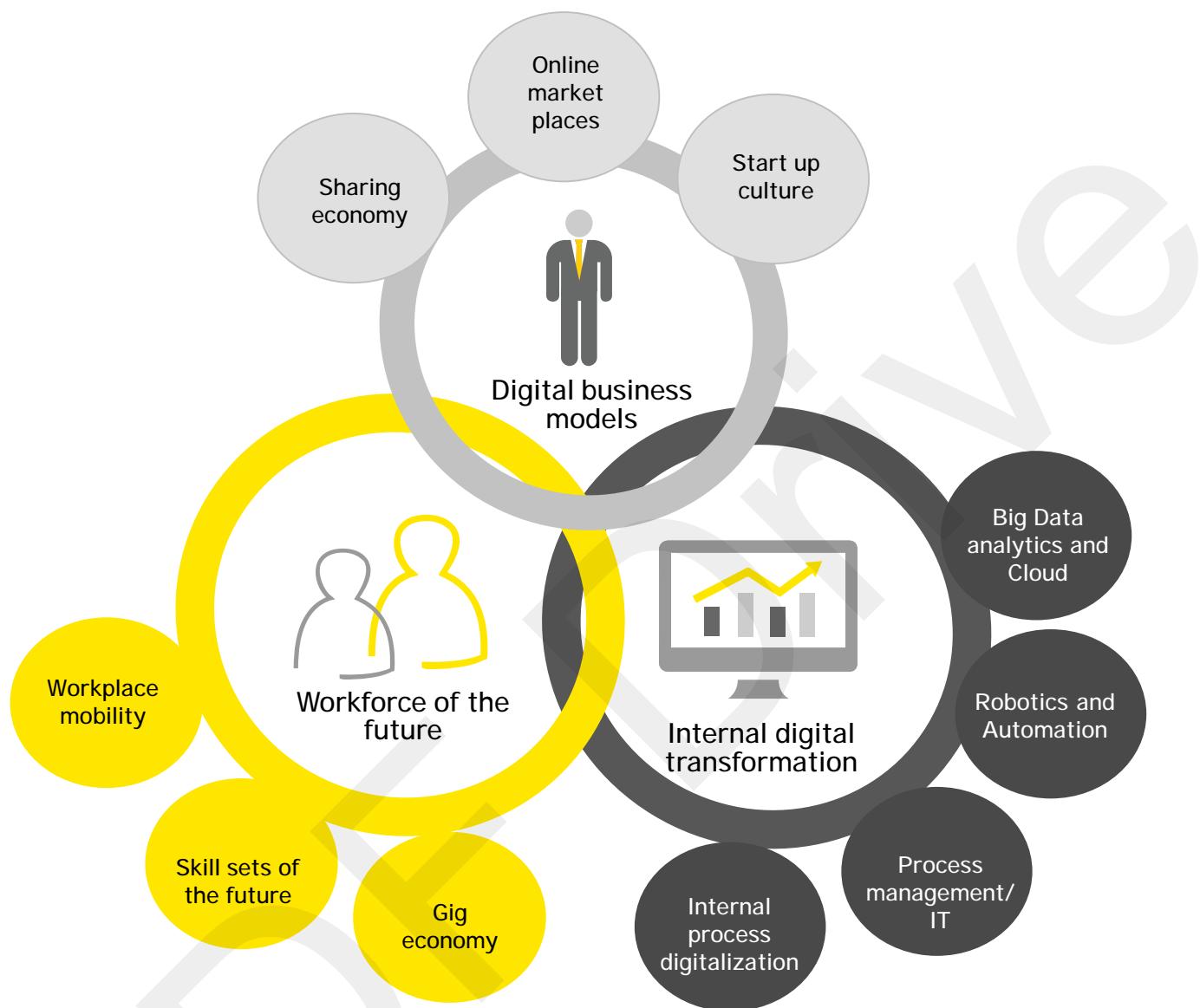
Adhaar holders can digitally sign electronic documents (2018)

13.5m

Documents uploaded by 9.2m registered users on DigiLocker

Source: Media articles, World Bank, Digital India progress

Realising value beyond bricks and mortar?



Why is the best digital strategy a human one?

Work force of the future

The world of work is changing dramatically, and the shape of the workforce is changing along. Digital is recreating the workforce experience across the entire organizational structure as companies embrace new digital operating models.

In a digitally connected world, organizations are moving towards 'workplace of the future'. Physical workspaces are being replaced by remote-working and the workforce is becoming increasingly global. Through integration of different technologies, employees are using new platforms to do work. From e-mail, instant messaging, enterprise social media tools

to business applications and virtual meeting tools, today, digital capabilities and technologies are getting ahead of workers and the traditional work culture. Bring Your Own Device (BYOD) and the use of enterprise technology resources have enabled employees to work regardless of their location or device; enhancing overall productivity. Telecommuting as a concept is also gaining ground. Aligning strategies that can help companies transform employee experience to bring efficiencies, innovation and growth, will continue to gain prominence.

India's favourable demographics are driving this new age workforce. With median age of 27, India is one of the youngest economies – China averages 37 years, Indonesia 28 years, while Russia 38 years. In fact, India's 440 million millennial population is larger than USA and China. India's rising millennial population is set to recast the economy.

Re-engineering talent

The rapid pace of change and the emergence of new technologies including cognitive, AR, VR and analytics is driving the demand for specialized talent. Increasingly, organizations are directing their people strategy toward preparing workforce to address skill sets of the future. As organizations become more consumer centric, devising a strategy that enables transformation of mindsets to become more front-ending and customer-oriented will be critical.

According to EY-NASSCOM study ‘Future of Jobs in India’, the snapshot of future jobs in organized sector reveals interesting insights:



	Workforce that		
	would be deployed in new jobs that do not exist today (projected for 2022)	would be deployed in jobs that have radically changed skill sets (projected for 2022)	will face an existential threat to their jobs (for 2017)
IT/BPM	10%-20%	60%-65%	20%-35%
Automotive	5%-10%	50%-55%	10%-15%
Textiles and apparel	5%-10%	35%-40%	15%-20%
BFSI	15%-20%	55%-60%	20%-25%
Retail	5%-10%	20%-25%	15%-20%

Source: EY Future of jobs

Embracing the 'gig' economy

Contingent workers are becoming more than a passing trend. With 24% share of the global online gig economy Indian freelance workers are charting new work arrangements.

The gig economy is providing employment opportunities to Indian software developers, creative and multimedia professionals, online sales and marketing professionals, writers, translators and data entry operators. This employment model is expected to grow significantly in the coming years.

Gig economy's growing presence: rising adoption of innovative working models



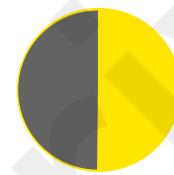
2 in 5
organizations expect to increase their use of the contingent workforce



1 in 3
employers of 100,000 employees or more expect to use **30% or more** contingent workers



1 in 4
Global freelancers are from India



50%
Of software-related global freelancers are from India

Sources: NASSCOM, Brookings India, Media articles, EY analysis

What happens when innovative disruption is the approach, and not just the agenda?

Dawn of the sharing economy

The sharing economy encompasses new business models leveraging multiple disruptive technologies (cloud-based collaborative apps, always-on mobile networks and the web) that exploit previously inaccessible information to match consumer needs to idle capacity – thus creating disruptive economic efficiencies.

Sharing economy has gathered pace and steam in recent times. The model draws considerable interest due to its benefits that range from on-demand instantaneous access

to goods and services, efficient utilization of unused inventory, across industries. For instance, in many countries, it is observed that "shareable goods" (such as vehicles, drills, lawn-movers) account for 20-30% of household expenditure.⁸ If the sharing economy platforms are effectively used, they could improve the utilization of underutilized assets and reduce overall spends. It also represents a paradigm shift in employment as it enables many to attain gainful employment through the rise of micro-entrepreneurship.

Segments of the sharing economy



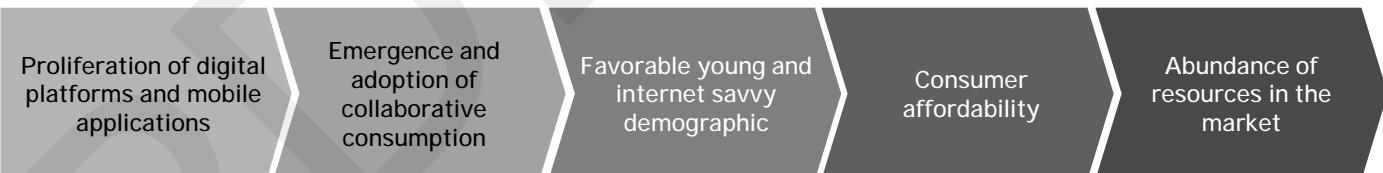
The sharing economy has seen dramatic success in the transportation and retail segments. Going forward, as industries converge and ride on the power of broadband, sharing economy will make rapid inroads to whole new range of intangible services including on demand cleaning and delivery services. The concept can also be leveraged to other sectors including healthcare and education. Infact, digital technologies (cloud, social media and analytics) are fostering an environment to enable seamless sharing in these industries. Since most of the sharing economy companies will leverage mobile as medium to reach customers, these companies are poised for rapid growth.



Sharing economy has witnessed tremendous growth in the last 5 years

	App based taxi operators
	India ranks at the top in the ride-sharing segment globally
	Of Indian people use ride-sharing applications
	Shared rides of overall trips made by taxi aggregators in major cities
	A sharing platform empowering farmers by allowing them to rent agricultural equipment
	Use mechanical equipment because they either cannot afford to buy it or because renting options are too difficult

Drivers



Emergence of online marketplace

India is shopping online. India is booking tickets online. India is also banking online.

E-commerce has finally arrived and digital commerce is beginning to flourish in India. The deep discount and cashback market strategy has paved the way for an arriving ecosystem to flourish. Connectivity is bridging the physical boundaries of customer access, and bringing in a massive change in the way retailers are engaging with their customers. Organizations are switching to omni-channel strategy and devising ways of integrating offline-online strategy.

In fact, traditional offline markets are also going online to capture a share of digital consumers. Being a volatile industry marked by dramatic changes in consumer behavior, organizations are increasingly targeting individual consumer needs using data and analytics, to address demands and stay relevant in the market.

In India, almost 75% of the well-funded startups are online marketplaces. With tablets and smartphones redefining connectivity and user experience, the increase in online marketplace and surge in connectivity will be a compelling proposition.

Convenience, discounts: attractors, timely delivery, return policy - differentiators

Attractors

Discounts and cheaper prices
Consumers prefer to buy products that are less expensive online vs. offline

Multiple payment modes
Cash on delivery is popular among buyers aged <30 years and 55+ years

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Convenience

40% of respondents chose e-tailing for convenience as the top most reason

Multiple product options

Easy access to wider range of goods at one place

Preferred brand availability

Attracts buyers from Tier II, Tier III and smaller cities where retail presence is low

Differentiators

Goods return policy
Consumer prefer an e-tailer offering good return policy

Timely deliveries
Consumers choose service providers that offer fastest delivery



Start-up culture

India continues to be the world's third largest startup ecosystem, amidst intensifying competition the UK and Israel. The expanded availability of Internet connectivity and smartphone proliferation have given impetus to startup growth.



# Unicorns	11	10	3
Average valuation per unicorn	1.6	3.2	1.2
% of advanced tech startups	8%	6%	17%
Incubators/accelerators	185+	190	185+

03

Is on-demand the new in-demand?

The 'on-demand' effect

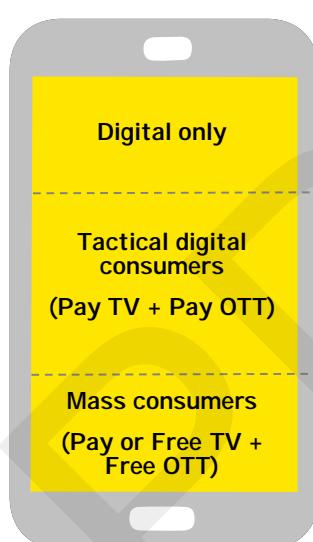
The digital trend book

77% digital media consumption is on mobile devices	200 minutes per day spent by Indians on mobile apps ⁹	40% Time spent by mobile internet user on social media in India; 30% on entertainment
93% of time spent on videos in Hindi and other regional languages	250 million people viewed videos online in 2017, a growth of 64% over 2016	70% of the content consumed was less than a year old; while long tail was 15% of consumption

The new customer segmentation

The proliferation of digital infrastructure will enable shifts in consumption patterns which will be based not as much on geographic, gender and age criteria, but more on the ability to pay.

Customer Segments in India by 2020



	2017	2020
Digital only	1-1.5 million Subscriber	4 million subscribers
Tactical digital consumers (Pay TV + Pay OTT)	6 million subscribers	20 million subscribers
Mass consumers (Pay or Free TV + Free OTT)	200+ million subscribers	500+ million subscribers

Growth in internet broadband penetration, coupled with falling data rates led to more consumption of content and increased time spent on digital media. Advertisers shifted spends to the digital medium, which led to digital advertising now contributing 17% of total advertising in 2017. The share of digital advertising is expected to grow to 22% by 2020. This growth will make Digital the third largest segment of the Indian M&E sector by 2020, overtaking Filmed Entertainment.

Digital subscription made a strong impact in 2017, with a growth of 50%. In India, there are around 2 million paid digital subscribers across application providers, and between 1 million to 1.5 million customers who have moved entirely to digital media consumption. By 2020, digital only consumers are expected to rise to 4 million, which along with millions of other tactical and mass customers will generate subscription revenues of US\$290m. The key reasons for higher adoption is availability of niche content, global content, increased OTT-only content, sports and falling data charges.

⁹ <https://timesofindia.indiatimes.com/business/industry-business/indians-spend-70-of-mobile-internet-time-on-social-entertainment/articleshow/62125840.cms> accessed on Feb 18, 2018

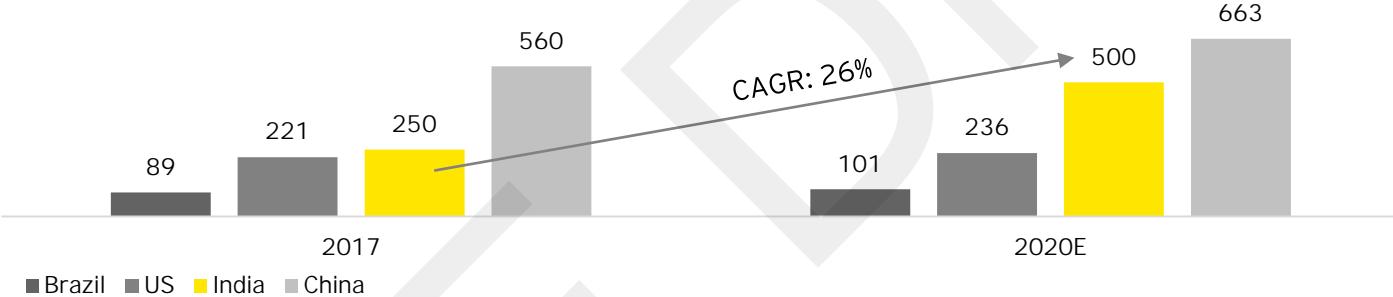
Consumption on rise

Online videos

As much as 250 million people viewed videos online in 2017, a growth of 64% from 2016; the fastest amongst global peers.¹⁰ Consumers have shown increased preference toward short-form content, with the average length of video viewed in India being around 20 minutes¹¹. Around 40% of total mobile traffic came from the consumption of video services in 2015. This figure is expected to touch 72% by 2020¹².

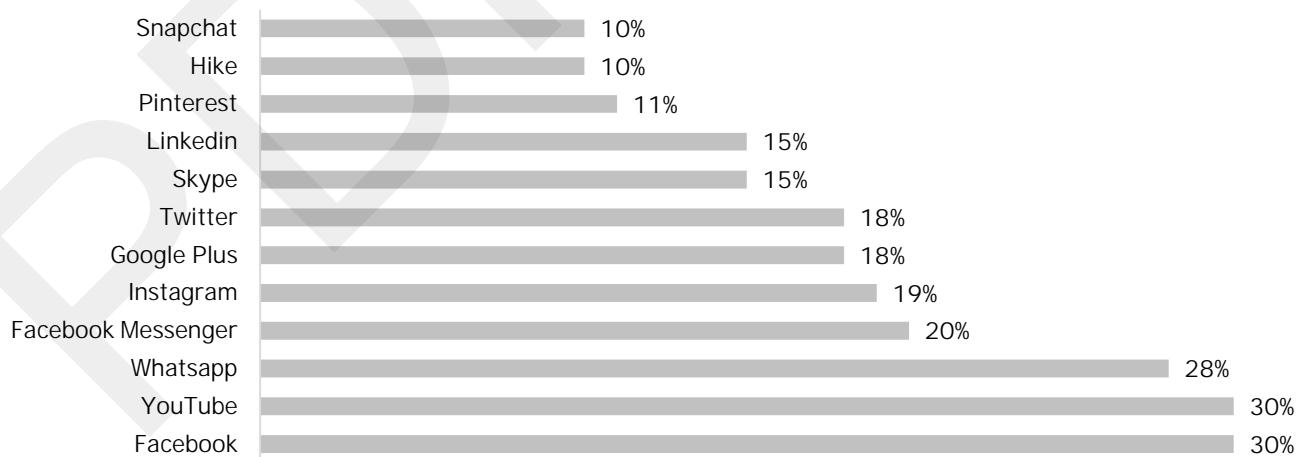
Video streaming remains a key driver of data traffic driven by rapid 4G adoption, and contributing to 65%-75% of mobile data traffic.¹³ An average user spends up to 2.5 times more watch time on mobile content than, the web.¹⁴ This marks an inflection point in data consumption as the early years of short-term consumption in videos were characterised by fears of data charges.

Comparison of online video audience (in million)



Source: EY-FICCI Re-imagining future of M&E in India, 2018

Penetration of leading social networks in India as of 2017



10 Re-imagining future of M&E in India, EY-FICCI, 2018

11 Re-imagining future of M&E in India, EY-FICCI, 2018

12 Re-imagining future of M&E in India, EY-FICCI, 2018

13 Nokia M-Bit Study 2018

14 Online video consumption grows 5 times in 2017: Report, ET, 22 Feb 2018

15 Indian Consumers Love to Share Mobile Videos, Reveals Vuclip Survey. See: <http://businesswireindia.com/news/news-details/indian-consumers-love-share-mobile-videos-reveals-vuclip-survey/36124>

Social media

India has already become the second largest market for social networking giants such as Facebook (with over 200million users) and LinkedIn (with over 42 million users) and is expected to surpass the US to lead the global tally of the largest Facebook user base on mobile devices in the next couple of years. About 65% of Indians share their videos through mobile today as compared to 53% globally during 2013.¹⁵

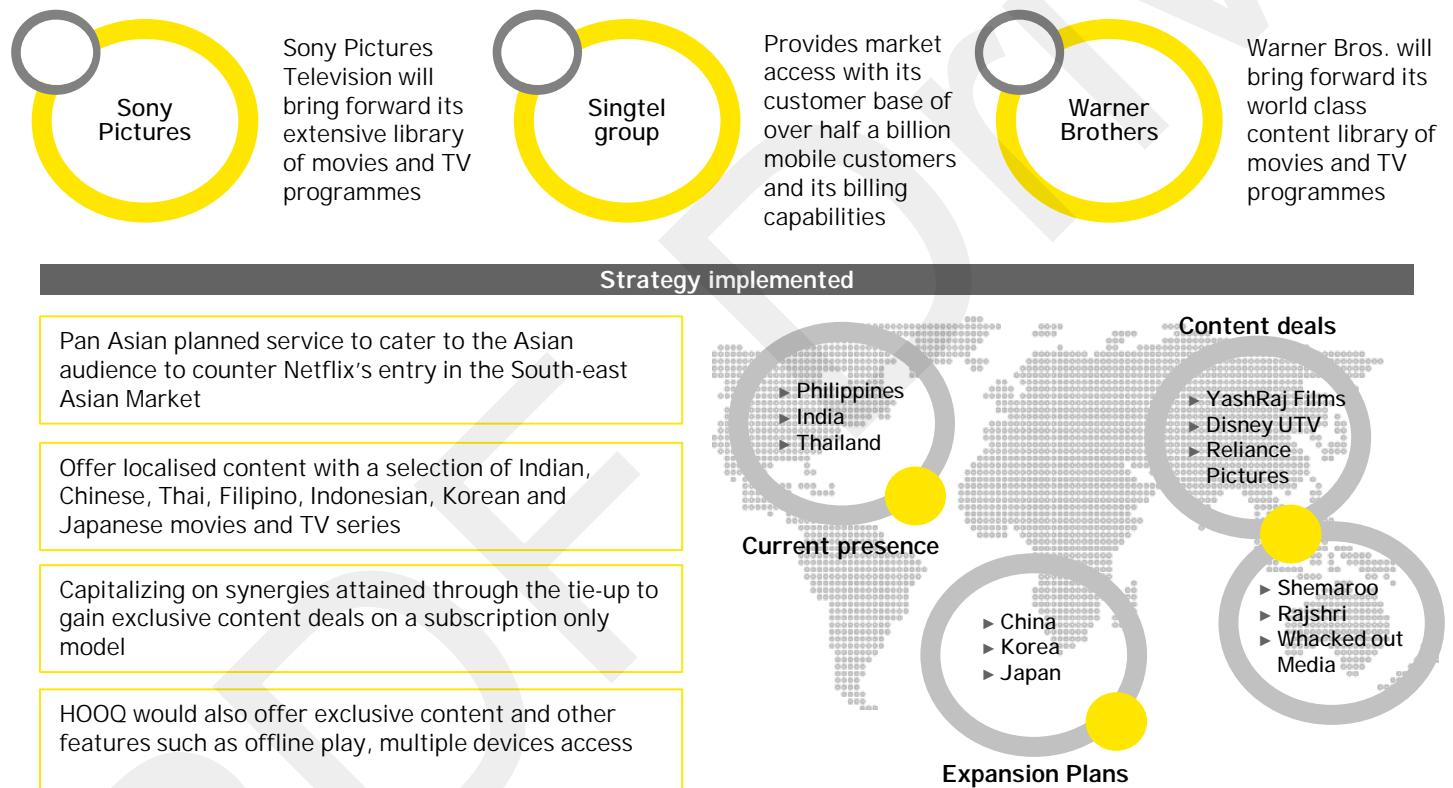
Increasingly, companies are leveraging on the social media platforms for developing engaging content, and in many instances, the mainstay of successful marketing campaigns. The rise of social media as a "brand's new voice" is a new strategy for driving engagement and technology to achieve scale. Cricket leagues like the IPL are a classic example of this trend.

What next?

Focus on developing original content

OTT players are extremely bullish on developing original content for consumers, which will act as a differentiator in the already crowded space. Netflix will be launching four to five new original shows in the next few months and is further planning to add more than 100 hours of content catering to the local market in India. Big Synergy, operating under Reliance, is all set to launch around six to seven web shows for digital platforms such as ALT Balaji, Netflix, Amazon, Vuclip, Applause Entertainment and VooT in 2018.

Case study: HOOQ: the first of many studio, telecom partnerships



Telecom Companies (Telcos) moving up the value chain

Telecom operators are becoming aggregator of content of all major broadcasters. While these services are offered free, but there is potential to switch on a charge based model or bundle with data packages; thus enabling them to increase the yield on their network. This would enable them to sell both bandwidth and content, including their own channels or other OTT channels.

Partnerships to be pivotal: Content and distribution

With the growing importance of the Indian OTT space, both global and local players are leveraging content and distribution partnerships to increase their subscriber base by offering differentiated content across multiple platforms.

TV and Digital convergence

The idiot box will neither die nor survive; it will just turn connected and digital thereby transforming it into another digital platform. The next few years will witness the proliferation of Customer provided equipment (CPEs), which will bring internet to TV and change the Electronic Program Guide screen on TV. This with fiber broadband-based triple play bundled with cable subscription can potentially alter the TV distribution and digital platform landscape in the country.

Leverage India for the globe

Users across the globe have an affinity towards Indian content. On one hand there are prospective users from the Indian sub-continent with similarity in languages, traditions, and shared history up taking the content. On the other hand, there are users from the Indian diaspora around the world interested in the Indian content offerings. To make international content available to the audience entering into the right content deal and planning content window sizing and making content easily accessible to the audience on the digital platforms are the critical aspects.

The Indian market has a vibrant IT/technology backed ecosystem on which start-ups are thriving. With global partnerships setting in and Asian markets being looked at as key growth segments by global players, India could provide an ideal base for market expansion in the Middle East and South East Asia. Several global conglomerates also have set up their dedicated product development centres out of India providing solutions on emerging areas like big data, analytics, IOT, etc.

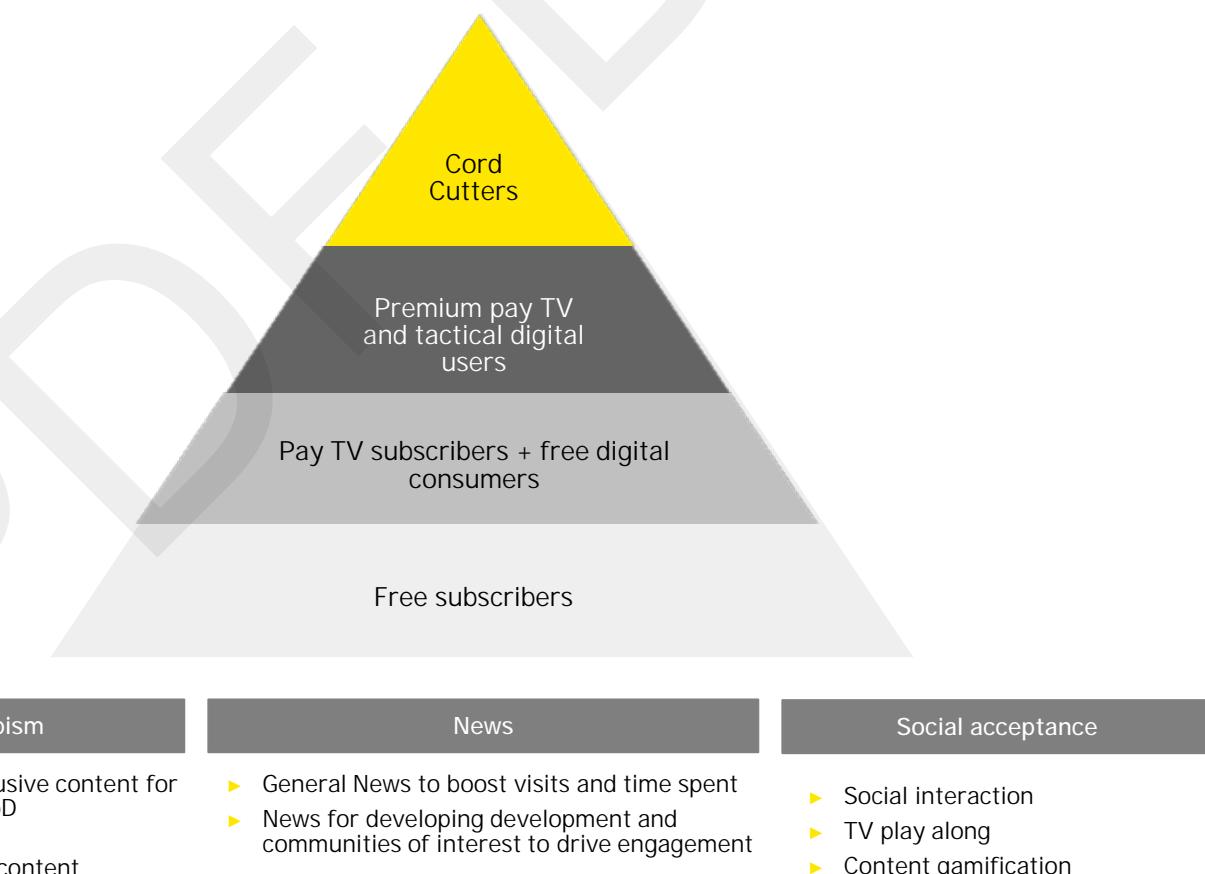
New market segmentation

New customer segments will emerge. At the top of the video consumption pyramid will be the cord cutters, who will focus exclusively on online-only consumption. In addition, there will be a large share of TV subscribers who will also subscribe to one or more OTT platforms or procure content piecemeal.

The next segment will be TV customers who will only watch free digital content. Finally, at the bottom of the pyramid, are free customers who will not pay and can only be monetized through advertising. Strategies to serve these segments vary.

Media companies will need to create different products for each media industry's three pillars namely escapism, knowledge dissemination and provision of social acceptance. Strategies may include providing exclusive content to premium subscribers, with or without aggregated content, to enable a width of offerings. Meanwhile, mass and free customers can provide a large subscriber base, but monetization will only be enabled through advertising.

This model requires scale to succeed. On the news and knowledge front, almost all news is free, whether linear or digital, and that is unlikely to change significantly. News is being used by OTT players to increase the frequency of visits to their apps (news apps and websites receive many multiples the number of visits relative to entertainment apps). But the game changer and most disruptive innovations will come from interactivity with customers. Through smartphones, content platforms can create immersive "play along" experiences with reality TV, "vote and be counted" involvement, "guess what happens next" challenges and much more around episodic content and events, particularly sports. We believe this new segmentation will drive a more focused approach to the creation of quality content, and as the inevitable shift takes place to data-driven decision making, the customer will truly benefit.





04

Inclusive growth.
Down to
government or up
to business?

Future proofing digital infrastructure

A series of pro-growth reforms underline the Government's commitment to develop a robust digital economy. Milestone initiatives under the umbrella of Digital India, Smart Cities, Make in India, Start-up India and Skill India are already redefining the country's digital profile. The government's latest endeavor, the draft National Digital Communications Policy 2018 aims to provide 'broadband for all' and enhance the contribution of the digital communications sector to 8% of India's GDP in 2022 from less than 6% in 2017.

The Government has set three missions:

- ▶ Connect India - to create robust digital communications
- ▶ Propel India - to harness the power of emerging digital technologies, including 5G, AI, IOT among others
- ▶ Secure India - to safeguard the digital sovereignty of India with a focus on ensuring individual autonomy and choice, data ownership, privacy and security

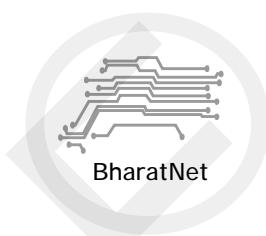
A 360 degree approach to address the need of digital infrastructure has infused a renewed sense of optimism. It marks a concentrated push toward laying strategic priorities and framework to scale availability, accessibility, and affordability for digital future. Building future ready infrastructure to support the convergence of a cluster of revolutionary technologies including 5G, the cloud, IOT and data analytics, along with a growing start-up community, and a strong digital engagement is poised to open a whole new gamut of opportunities.

Closing broadband access and usage gaps is an urgent and complex task, essential to developing the digital economy. One factor that has been identified as key in the process is the regulatory environment. The right regulatory environment can ensure that consumers can use full palette of new opportunities and services brought about by the greater choice of devices, online services and applications. This is realized by creating the right framework for consumer protection, investment and innovation.

Connecting the unconnected: Milestone government programs



Digital India



BharatNet



Smart Cities



Make in India

<ul style="list-style-type: none"> ▶ Transform India into a digitally empowered society and a knowledge economy at the back of broadband highways ▶ Envisages Infrastructure as a utility to every citizen ▶ Thrust on e-governance and services on demand ▶ Digital empowerment and universal digital literacy ▶ The 9 pillars of digital India: <ul style="list-style-type: none"> ▶ Broadband Highway ▶ Universal access to mobile connectivity ▶ Public Internet Access ▶ E-Governance (Reforming government through technology) ▶ E-Kranti (electronic delivery of services) ▶ Information for all ▶ Electronics manufacturing ▶ IT for jobs ▶ Early harvest programmes 	<ul style="list-style-type: none"> ▶ Launched in 2015, with the objective of expediting connectivity to 250,000 Gram Panchayats (GP) ▶ Laying Optic Fiber Cables as backbone for seamless connectivity ▶ Modified approach in July 2017 with thrust on <ul style="list-style-type: none"> ▶ last mile connectivity through Wi-Fi or suitable technology for faster delivery of services ▶ Provision for the operations and maintenance of the entire 250,000 GPs ▶ Implementation through States, Private Sector besides CPSUs as in Phase-I ▶ National Digital Communications Policy 2018 (draft) envisages providing 1Gbps to 600,000 villages 	<ul style="list-style-type: none"> ▶ Plan to build 100 smart cities by 2021-22. In January 2018, 99 smart cities identified ▶ Broadband as the backbone of smart city provisioned with smart systems ▶ Seamless and effective framework on essential public utilities such as water, power, clean air, and traffic management ▶ Making governance citizen-friendly and cost effective ▶ Identity for a city - based on its main economic activity, such as local cuisine, health, education, arts and craft, culture, sports goods, furniture, hosiery, textile, dairy, etc 	<ul style="list-style-type: none"> ▶ Transform India into a global design and manufacturing hub with emphasis on 25 sectors ▶ Promote large scale manufacturing/ assembling activity to achieve production of 500m units of handsets by 2019 ▶ Bringing investment, fostering innovation and enhancing skill development ▶ Focus on ESDM for promotion of manufacturing of electronic systems ▶ Net zero imports by 2020
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Growth in e-governance



84.2m
2017 **6.6m**
2014

12.8x rise in 'e-taal' transactions per day

Enabling Optic Fiber Connectivity



3.31
Lakh Kms
2018 **358**
Kms
2014

106,756 GPs connected with Optic Fiber

Establishing a Digital identity



1.2b
2017 **0.6b**
2014

2x rise in 'Aadhar' registered users

Towards a cashless economy

40x
2017 **20m**
2017 **1.8m**
2017

Increase in UPI
transactions
since 2016

Downloads of
BHIM mobile
application

Transactions
on BHIM per
day

Making in India



225m
2017 **60m**
2014

3.7x rise in Mobile handsets manufactured
and 115 new plants set up

Enabling a smarter city, connected nation



79
Completed **US\$29b**
Project cost for 90
cities

US\$1.1b outlay for 2018-19; 1.5x rise in
allocation to spur growth

Accelerating growth of e-services



US\$32.3b
2017

1.7x rise in e-commerce

172
2017

Major e-hospitals
at National
Informatics Center

585
2017

Agriculture
produce markets
unified in 12 states

7m
2017

Pensioners
registered under
Jeevan Praman

Continuing the growth momentum

Products

- ▶ Digital Locker
- ▶ E-hospitals
- ▶ E-signs
- ▶ Digital agents
- ▶ Meghraj - virtual data centers

Platforms

- ▶ Digital India portal and mobile apps
- ▶ MyGov mobile app
- ▶ Swachch Bharat mission app
- ▶ BHIM

Institutions

- ▶ Center for flexible electronics
- ▶ Center for Excellence, DOT
- ▶ BharatNet
- ▶ NGN, TRAI

Policies

- ▶ E-governance
- ▶ Electronic Development fund policy
- ▶ M2M regulations
- ▶ National Digital Communications policy-2018 (draft)

Adopting a 'Fiber first' strategy

Government of India has proposed to implement a 'Fiber First Initiative'¹⁶ through the draft NDCP 2018. The draft lays emphasis on importance of fiber both for fixed broadband (to serve homes and enterprises) and next generation mobile technology (4G/5G) transitions. It clearly highlights the criticality to focus on fixed infrastructure development.

- ▶ According telecom optic fiber cables the status of 'public utility'
- ▶ Promoting collaboration models involving state, local bodies and private sector for provision of shared duct infrastructure in municipalities, rural areas and national highways
- ▶ Facilitating Fiber-to-the-tower program to enable fiberisation of at least 60% base stations
- ▶ Leveraging existing assets of the broadcasting and power sector to improve connectivity, affordability and sustainability
- ▶ Incentivizing and promoting fiber connectivity for all new developmental construction
- ▶ Requirement for telecom installations and the associated cabling and in-building solutions mandatory in all commercial, residential and office spaces by amending National Building Code of India (NBC), through Bureau of Indian Standards (BIS)

Fiber funds

The draft NDCP 2018 also recognizes implementation of broadband initiatives, to be funded through USOF and Public Private Partnerships:

- ▶ BharatNet: Providing 1 Gbps to Gram Panchayats upgradeable to 10 Gbps
- ▶ GramNet : Connecting all key rural development institutions with 10 Mbps upgradeable to 100 Mbps

Italy's Open Fiber enlists banks for US\$8 billion broadband rollout¹⁷

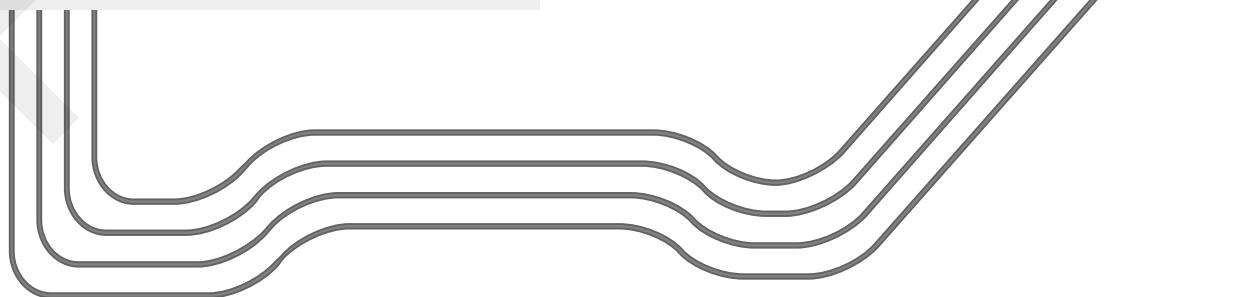
- ▶ Open Fiber - jointly owned by state-controlled utility Enel and state lender Cassa Depositi e Prestiti
- ▶ New 2018-2027 plan - to take its fiber-optic network to 19 million homes and businesses
- ▶ Network to cover 271 Italian cities and 7,000 municipalities in the country

France's biggest optical fiber PPP contract of over US\$1b for private financing¹⁸

- ▶ The THD Grand Est PPP project is France's biggest optical fiber PPP contract and one of the largest in Europe
- ▶ To connect one million households and businesses across over 3,600 cities
- ▶ Construction of the project is due to be completed in 2022, with a total term of 35 years

Establishment a National digital grid

- ▶ Creating National Fiber Authority
- ▶ Establishing Common service ducts and utility corridors in all new city and highway road projects
- ▶ Creating a collaborative institutional mechanism between Centre, States and local bodies for common RoW, standardization of costs and timelines; and removal of barriers to approvals
- ▶ Facilitating development of open access next generation networks



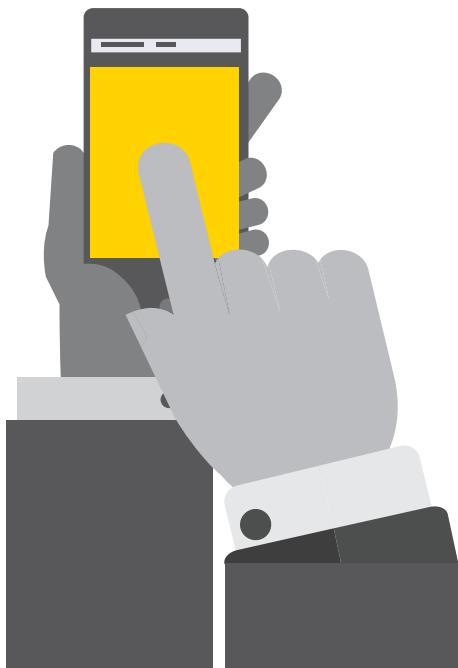
¹⁶ National Digital Communications Policy 2018 (Draft), DoT

¹⁷ <https://www.reuters.com/article/us-openfiber-plan-funding/italys-open-fiber-enlists-banks-for-8-billion-broadband-rollout-idUSKBN1HK29X>

¹⁸ <https://www.mottmac.com/releases/financing-completed-on-frances-largest-optical--ppp-contract>

Optimize for today? Build for tomorrow?

India will be consuming lot more data



6.5 EB

IP traffic to grow 4x by 2021
CAGR 30% (2016-21)
1.7 EB in 2016

49%

Mobile data traffic will
grow 7x from 2016 to
2021; at a CAGR of

132.5GB

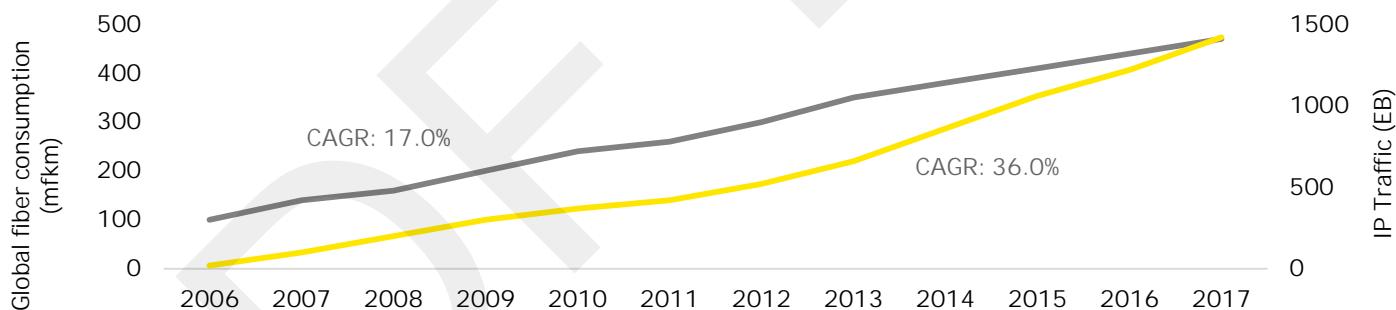
Average internet traffic per month
generated by a FTTx Internet
household in 2021; 163.4% more
than other broadband households

159,201 years

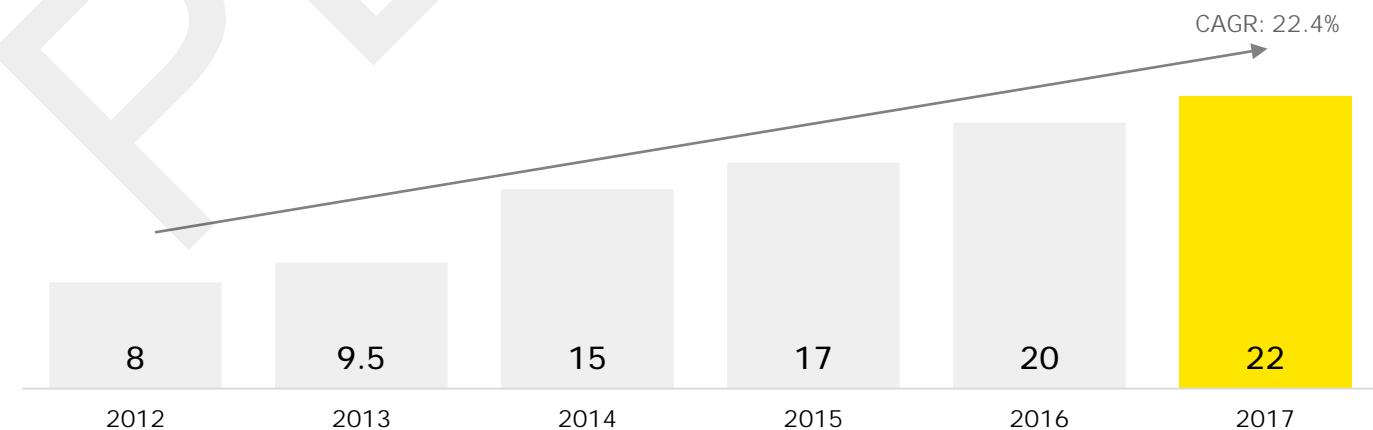
Or 84 billion minutes of video
content will cross each month by
2021, equal to 31,840 minutes
of video streamed every second

Data usage growth linked to optic fiber consumption¹⁹

More data = More fiber



India's fiber deployments indicating a steady rise, million fibre km



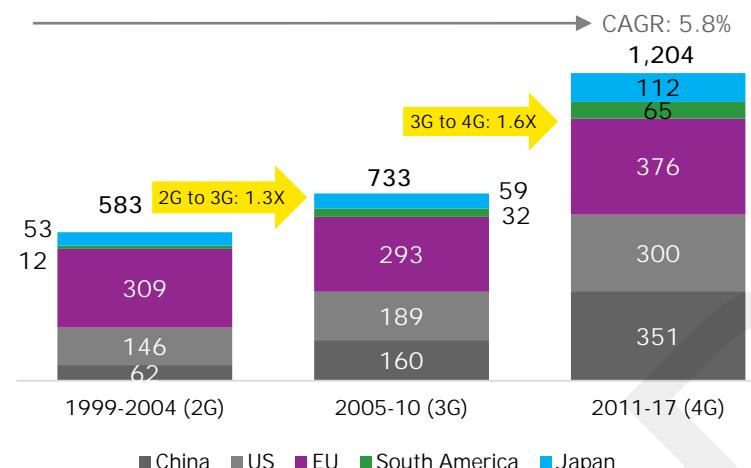
The need for high fiber diet

Many studies have shown a clear correlation between network quality and degree of digitalization, which is a particular issue in many emerging markets such as India, transitioning from 3G to 4G, expanding fixed broadband and planning for 5G. Developing the best-in class broadband infrastructure for

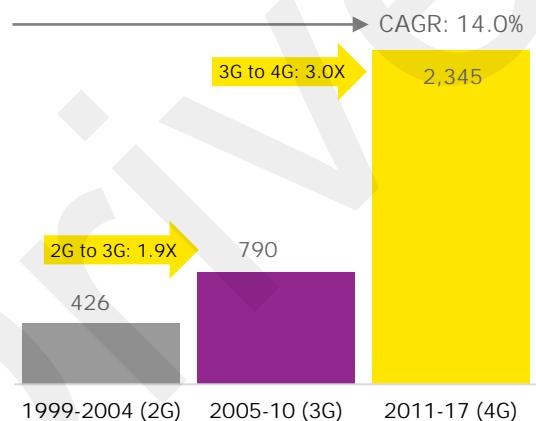
creating the Gigabit society is instrumental to India's digital transformation. In essence, there is need for a combination of fiber and wireless technology to meet the increasing bandwidth demand.

Fiber consumption cycle with evolution of next-gen evolution²⁰

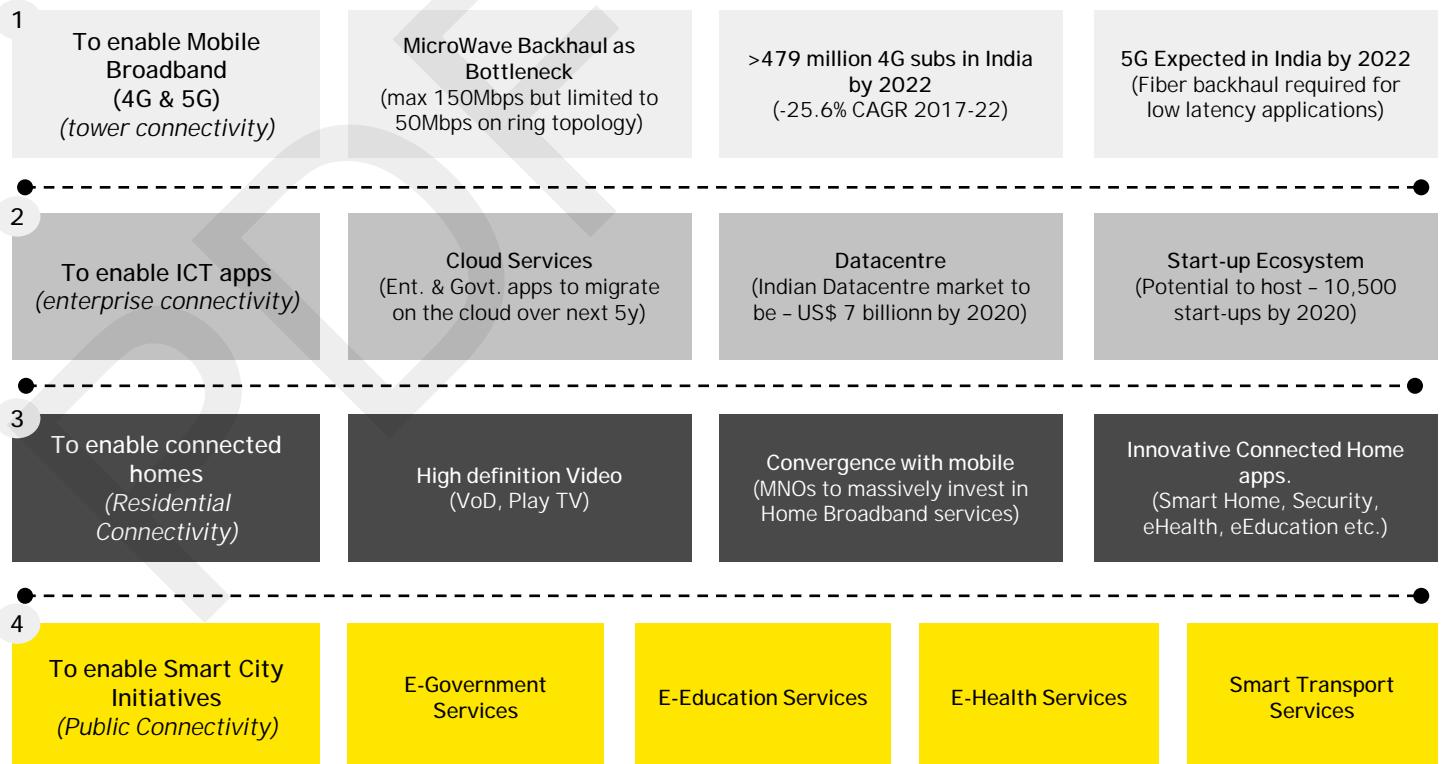
Top 15 Global Telco Capex (US \$ billion)



Global OFC consumption (million fkm)



Drivers for fiber roll out



Source: Nasscom

Diverse geography, disparate population and economic distribution among the rich and the poor pose serious challenges to operators, preventing uniform investments across different telecom circles. Also, issues such as Right of Way (RoW) have created uncertainty in fiber investments across states. The problem, in a nutshell, is that while data traffic growth soars, the business case for network operators to invest in upgrading mobile networks is weak because operators have only a small share in the value of the projected growth.

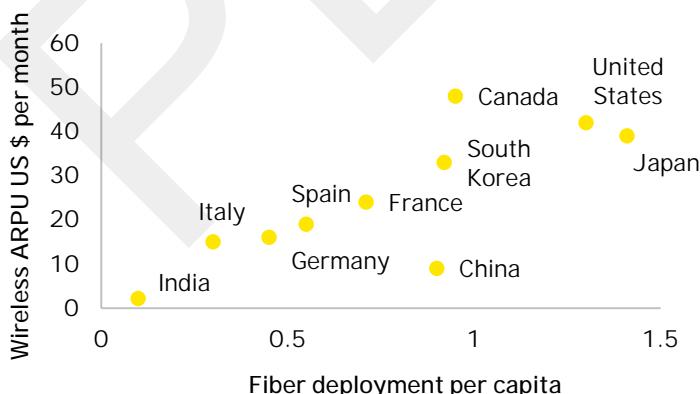
Tower fiberisation	Capex	Average Internet speeds ²¹	Optical fiber rollout, fkm per capita
In India, 20%- 25% of telecom towers carry fiber optics; the average in the US, China and Korea is 65%-80%.	Fiberizing 70% of the towers will require an estimated 600,000 fKm; at an investment of US\$8b	India: 3.5 Mbps South Korea: 29 Mbps, U.S: 15 Mbps China: 4.3Mbps.	China: 0.9x India: 0.1x US: 1.4x

Renewed focus on strengthening backhaul

Telecom networks are only as good as their backhaul, the wireless communication, and network infrastructure responsible for transporting communication data from end users. In a higher quality 4G environment, microwave-based backhaul will become less relevant and there will be a need for more fiber. While the initial investments are huge, rewards are considerable and include new revenue streams such as residential broadband and enterprise services. For telcos to fully monetize the spectrum they have purchased over the past two years, they will have to add more fiber to their networks.

With a promise of 10Gbps speed, less than 1 ms latency and 90% reduction in network energy utilisation, 5G will spur the next round of telecom infrastructure investments. The fact that 5G network will have to support bursty data from emerging applications like video on demand (VoD), IoT, smart Cities, and the like also makes backhaul a critical concern. As demand for 4G and then 5G grows, networks will become denser and deeper – making fiberization an imperative.

Fiber backhauls to improve data ARPU (2016)²²



Fiber-to-the-home: step to Gigabit society

The fiber deployment in India is still characterized by significant capacity on trunk and national long distance (NLD) routes, but there is very little capacity in the access routes. Fiber-to-the-x (FTTx) and Fiber-to-the-home (FTTH) forms a minuscule proportion of an already limited fixed broadband access user base.

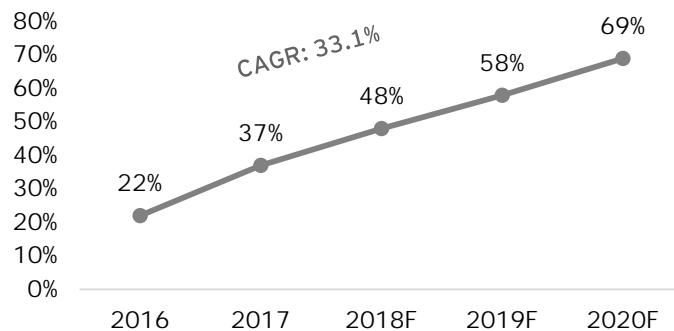
Average Internet speeds ²¹	Optical fiber rollout, fkm per capita
India: 3.5 Mbps South Korea: 29 Mbps, U.S: 15 Mbps China: 4.3Mbps.	China: 0.9x India: 0.1x US: 1.4x

India has 0.5% penetration for FTTH compared to global countries such as Singapore with 95%, South Korea with 83% penetration, Hong Kong at 71% and Malaysia 16%. In India, FTTH model is currently expensive compared to other countries and its standalone viability remains uncertain. This is majorly due to lack of a financially viable business case for deployment of FTTH. In India, FTTH model is currently expensive compared to other countries and its standalone viability remains uncertain.

#Broadband2022

- ▶ Fixed broadband to rise to 113.5m household connections, at a CAGR of 40.7% during 2017-22
- ▶ FTTH and DSL broadband providers to be dominant in the segment
- ▶ Fixed broadband revenues expected to reach over US\$12 billion, increasing at a CAGR of 43.7% during 2017-22

Fiberization curve: Towers fiberized to increase to 333,000



21 <https://telecom.economictimes.indiatimes.com/tele-talk/fiber-investments-key-to-success-of-5g-in-india/2452>

22 HSBC Global Research, India Towers, January 2017

23 HSBC Global Research, India Towers, January 2017

24 <http://www.dnaindia.com/business/report-govt-plans-fiber-to-the-home-services-2556490>

High fiber cost – civil work major contributor to RoW costs

FTTH construction cost per subscriber (US\$)



Source: ITU, EY analysis

With each generation fiber is getting closer to the user

- 2G** ●-----● Major cities
- 3G** ●-----● Most cities, towns and sub-urban areas
- 4G** ●-----● Between towers as backhaul
- 5G** ●-----● Small cells, buildings and homes

Indonesian operators laying targeted FTTx



An Indonesian player's FTTx coverage is focused on higher-income areas (coverage reached just 2.6% of households at year-end 2016). Across its business, the player has recorded high EBITDA margins – of 58% in 2016. The high-income levels in its coverage area enabled the operator to generate a healthy blended ARPU (US\$31) in 2016.

Innovative models for fiber deployment

Leading operators are now mulling ways to reduce the capex associated with fiber deployments. Infrastructure sharing and leasing are gaining popularity among mobile and cable operators in developing markets. In India, the Department of Telecommunication(DoT)'s amendment of unified license scheme for active infrastructure sharing and the revised

public private partnership (PPP) model for BharatNet project adopted last year are two timely steps to boost the infrastructure sharing efforts by operators. Combined with this, a consensus on RoW is also expected soon across all Indian states.

Fiber deployment models

Telco

The telecom operator lays the fiber and operates it as part of the next of the network
Telcos can off-load their fiber assets and form a FiberCo

FiberCo

Any independent fiber company can take up the role of a FiberCo where they offer dark or lit fiber, based on license conditions

TowerCo

Indian towerCos under the current license conditions, can offer dark fiber and lease it out to service providers

Utilities

Utilities use their existing infrastructure and RoW permissions for laying out dark fiber and lease it out to service providers

Acquire additional licenses to move from dark fiber to lit fiber leasing

Opex based deployment methods

Fiber-grid

A fiber-grid model can be explored where the fiber assets of all owners are aggregated to build a one-stop shop for dark fiber on a pan-India basis

The owners together can operate and maintain the entire pool of fiber assets and drive planned expansions

Build-operate-transfer

Sell a portion or the entirety of a fiber network to a third party or asset manager

Monetizing prior investments in a fiber network through a build-operate-transfer model would provide liquidity for independent players and utilities in the fiber business

Utility as a wholesale operator, with government ownership or under government initiative

- ▶ Modelled around a joint-venture with the government or funding based relationship with the government
- ▶ Utility leads fiber roll-outs backed by government funding, specially for driving rural broadband

Utility as a wholesale operator with telco partnership

- ▶ The utility offers wholesale services to telecom operators
- ▶ Telcos use the fiber network for rendering services

Leveraging synergies for fiber infrastructure

Power and utilities

As alternative network providers, utilities are well positioned to play a complementary role in national fiber development, capitalizing on their existing infrastructure. Supporting co-investment strategies with utilities can help to lower costs and share risks. For instance, a power utility's tower infrastructure deployed for core services is ideal for fiber deployments.

Power utility across the globe are involved in fiber roll-outs

Global cases of fiber companies set by power utilities		Denmark	United States	New Zealand	Norway	Italy	Ireland
Utility	Multi-utility partnership	EPB	Northpower	Multi-utility partnership	Enel	ESB	
fiber venture	WAOO	EPB fiber	Northpower fiber	Altibox	Open Fiber	SIRO	
Business model	Retail	Retail	Wholesale	Retail	Retail	Wholesale	

Source: EY analysis

Fiber deployment in London through sewers



London based broadband service provider signed an agreement to deploy fiber in the city's sewers:

- ▶ The service provider estimates reduction in network deployment costs by 60%
- ▶ Deploy of connectivity services at up to 10 times faster rate than through traditional digs.
- ▶ Further, the London sewage system typically has pipes sitting as deep as 10 metres underground, making it much less susceptible to tampering or inadvertent outage. In comparison, conventional digs, in which telecommunications cable is laid, is as shallow as 12 inches below ground level.

Real estate developers

Real estate developers are one of the new entrants that are actively leading FTTx deployments. The real estate developers usually have RoW within their development area. An emerging model of FTTx has the real estate developers partnering with telcos and ISPs for roll outs. While service providers supply fiber and access to end users, the developers provide manholes and carry out the ducting exercise in their buildings.



China



Portugal



South Korea



Rwanda

In China, Ministry of Housing mandates all developers must deploy FTTH facilities in new constructed and refurbished houses, buildings and communities

In Portugal new buildings are mandatorily equipped with at least 2 fibers per home to be shared by operators, with the in-house wiring belonging to building owner

In South Korea the building certification Program (BCP) introduced in 1999 attempts to connect new apartment building to 4 optical fiber cables.

In Rwanda where it is mandatory for every new housing estate built in Kigali (capital) to cater to broadband access

Source: EY analysis



Making India a global optical fiber manufacturing hub

India has a strong optical fiber and cable manufacturing industry, with six fiber factories and 17 optical cable factories. India's optical fiber and cable shipments have been higher than the local demand during 2015-17, suggesting a positive net trade and growing local manufacturing industry of optical fiber and cables²⁵.

Figure: India's fiber and cable shipments vs. demand as % of global fiber and cable market²⁶

Million fKm

Country	Shipments of optical fiber			Demand of optical fiber		
	2015	2016	2017	2015	2016	2017
China	257.8	294.7	346.8	250.8	286.1	332.6
US	49.1	54.6	64.0	42.3	47.7	54.3
India	30.3	34.5	38.6	21.2	25.7	28.9
World	413.8	464.4	533.5	413.8	464.4	533.5

Net trade		
2015	2016	2017
7.0	8.6	14.1
6.8	6.9	9.7
9.1	8.8	9.7

Country	Shipments of optical fiber cable			Demand of optical fiber cable		
	2015	2016	2017	2015	2016	2017
China	231.9	263.8	307.3	216.0	243.7	286.1
US	39.2	44.4	50.5	37.6	41.9	48.8
India	19.7	23.9	26.9	16.2	19.5	20.5
World	382.4	429.0	492.8	382.4	429.0	492.8

OFC Net trade		
2015	2016	2017
15.9	20.1	21.3
1.6	2.5	1.7
3.5	4.4	6.4

Note: Net trade = Shipments - demand

Source: CRU International, EY analysis

There is a latent domestic demand of fiber and fiber cables to cater to the boom in broadband infrastructure requirements. In order to meet the rising demand, the country needs to increase domestic manufacturing. As a result economies of scale will come in to play making domestic manufactures competitive for global markets – propelling India to be the fibre capital of the world.

special incentive package could be considered for the industry to make India self-sustaining in the end-to-end production of high quality optical fiber.

Encouraging local manufacturing of preform

India is one of the world leaders in semiconductor grade chemical vapour deposition to produce extremely pure and pristine glass called 'preform' which is used in the manufacture of OFC. This critical and complex manufacturing ensures our self-sustenance in manufacturing. Manufacturing of preform must be encouraged so that India moves up the value chain of quality fiber manufacturing.

05

Can local manufacturing power exports?

From 'Make in India' to 'Made in India'

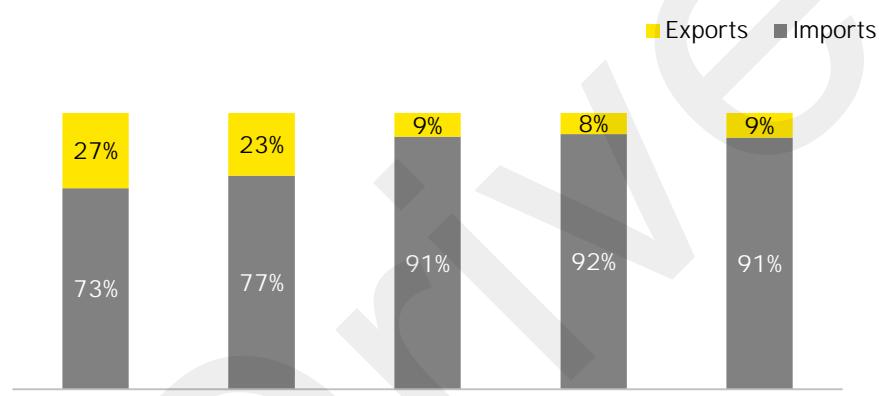
India is highly import reliant for telecoms equipment. From 2012-16, import bill has increased at a rate of 16.3% annually while the exports have declined at an annual rate of 17.9%²⁷. The Government has set three missions:

Demand for telecom equipment in India is primarily met through imports



Source: Voice and Data

Rising imports for telecom equipment in India



Source: DoT

Striving toward achieving self-sufficiency

The industry needs an added impetus to make both production and consumption of domestically manufactured products commercially viable. The disability for India's telecom equipment manufacturing – the difference in the selling price of a product manufactured in India and the price of same/similar product when imported, including all import taxes, as a percentage of the selling price of products manufactured in India – needs to be minimized.

Given the growth prospects, efforts should be directed toward boosting domestic manufacturing and gradually increasing exports to make India a global telecom equipment manufacturing destination. This resonates with the Government's overarching agenda to promote an ecosystem for design, R&D, IPR creation, manufacturing, standardization and testing for domestic telecom equipment production.

Encouraging local manufacturing of telecom equipment

The government has imposed 10% BCD on import of most of the telecom equipment but has kept the parts used to make them outside the ambit, thus, promoting local manufacturing of telecom equipment. As per the new duty, most of the telecoms equipment are 10% more expensive as compared to indigenous assembly.

Make in India program to boost handset and component manufacturing

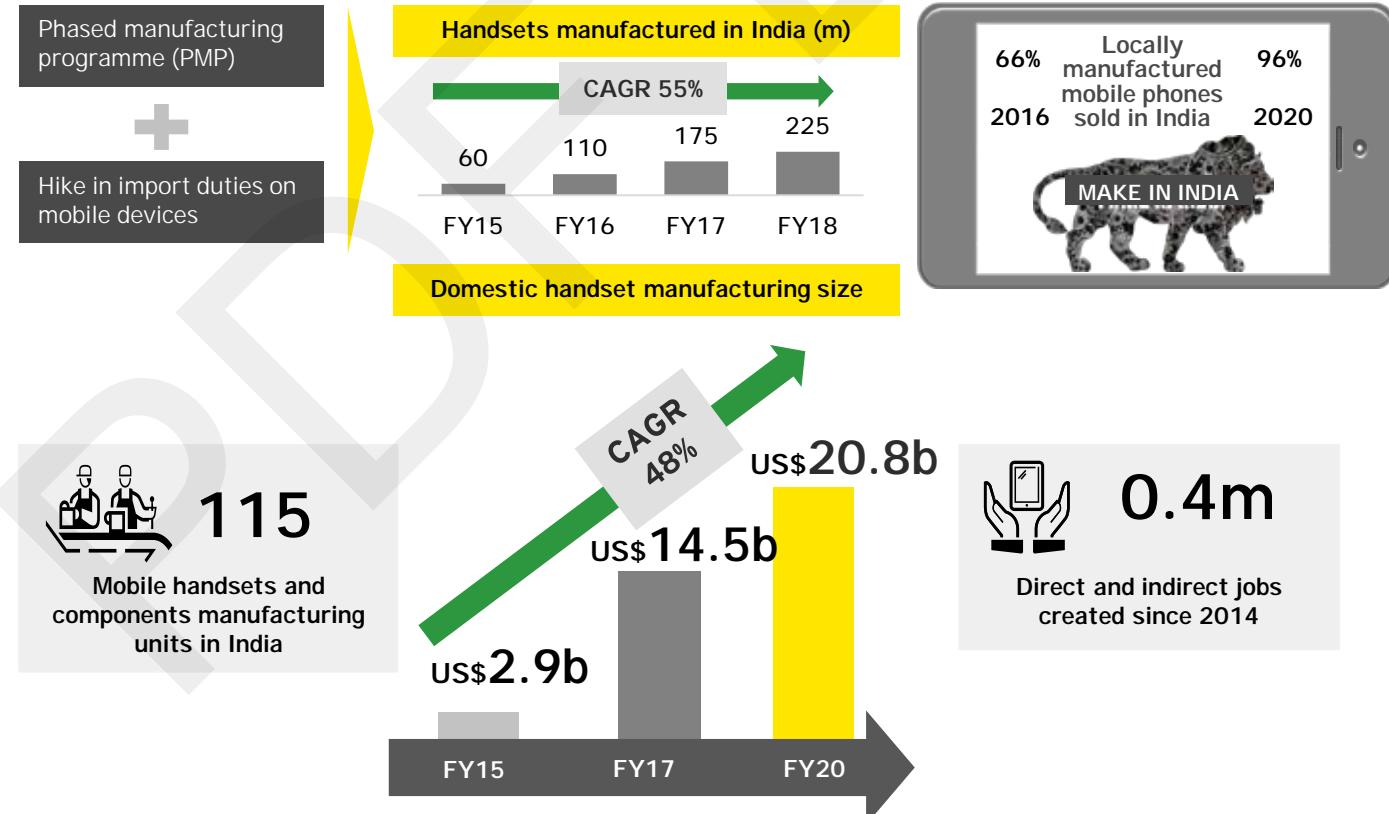
Growing demand for smartphones, highly competitive smartphone market, and Government policy initiatives are driving local assembly to India, with an aim to bring end-to-end manufacturing. Much of the domestic mobile phone production in India is limited to assembling/packaging of semi-knocked down (SKD) kits. This low level of local value addition is due to a weak manufacturing ecosystem which in turn stems from limited capabilities across various stages of the manufacturing value chain.

India's strong software development skills, low barriers to entry, high growth market, relatively low-cost skilled labour and existing mobile phones manufacturing facilities provide companies an advantage to reduce the overall cost of production.

Under 'Make in India', 115-odd mobile devices and component manufacturers have committed over INR450b investment to manufacture in India. The total capital investment by device and component players by the end of

The government expects India's handset manufacturing industry to grow to US\$500 billion (US\$230 billion from mobile phones and US\$270 billion from components) in five to seven years, boosted by the phased manufacturing programme (PMP) under which basic customs duty on mobile phones could be the key to incentivize local production.

2018 under the Phased manufacturing programme (PMP) is expected to hit INR57b with a majority of it likely to come this year. As of 2017, their total investment was around US\$ 0.3billion²⁸. Over 350 mobile charger factories are expected to be set up in India by 2025, on the back of the government's push to encourage production of battery chargers. Setting up of these factories is expected to lead to production of 1.46 billion chargers and generate 0.8 million jobs²⁹.



Currency conversion used: 1 USD = 65 INR

Source: Enixta IAMAI, Media articles

Mobile handset manufacturers are taking steps to scale up their manufacturing operations either on their own or with contract manufacturers in the country. The Fast Track Task Force (FTTF), a body under Ministry of Electronics and IT, has set target to produce around 500 million mobile phone production in India by 2019. Of these, the body has set the target to export 120million mobile phone units³⁰.

The story is similar in feature phones too – net value addition is at 21%, though the target was over 25%. Printed circuit board assembly in India will lead to a major value addition in the times to come.

In smartphones, the current net value addition for most in the industry is 11%, against the 2017 target of 14.7% . Mobile players expect to raise the value addition in smartphones to at least 18% in 2018. The total net value addition targeted for smartphones is around 40% by 2020

Manufacturing in China

Key incentives provided by China government

China – Full government support to boost manufacturing



Tax incentives

- ▶ Offered tax exemption of up to 50% to foreign companies transferring technology to Chinese firms
- ▶ Has set up science and technology parks to give bevy of tax exemptions and concessions



Low cost bank loans

- ▶ Bank offers credit at 2% interest , payable in 15-20 years, interest becomes due only from fifth year
- ▶ China has comparatively low lending rate of ~6% leading to increase in investments and acceleration in the growth of the manufacturing industry



Government policies to develop component ecosystem

- ▶ Protected manufacturers by introducing licensing regulation to restrict entry of foreign players
- ▶ Prior to China joining WTO, Government made it compulsory for the foreign invested enterprises to give priority to local market when purchasing raw material



Land use rights at minimal fee

- ▶ Government owns land, builds right infrastructure and provides land use rights to companies at minimal fee
- ▶ Manufacturing locations along with their vendor base located near ports facilitating exports
- ▶ Low power (~25% less than that of Taiwan) and water costs (~75% less than global average cost) for industrial use



Other advantages

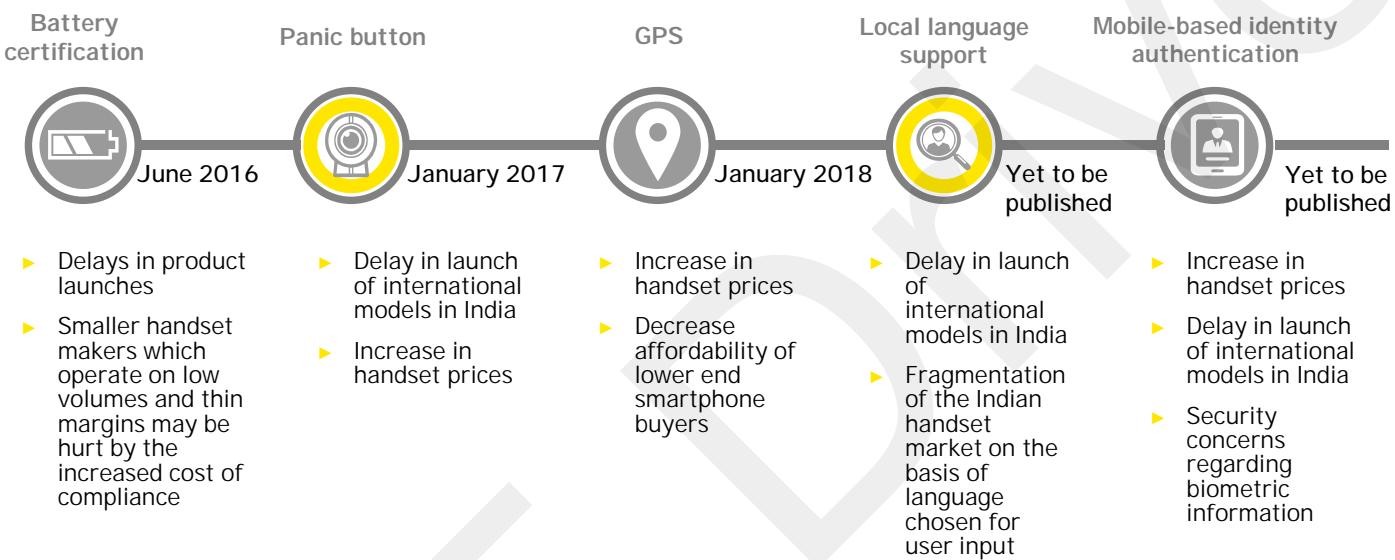
- ▶ High labor productivity due to advancement of technology, transfer of technology from foreign players and lenient labour laws such as longer working time, flexibility to hire and fire etc.
- ▶ Skill development through vocational training

New mandates can make smartphones expensive

In the last couple of years, the government has introduced a series of mandates on specifications for mobile phones sold in India. Although these mandates are intended to provide safety and choice of language to users, they also impact manufacturing ecosystem due to the uncertainty in regulations and push up costs due to the excessive customization required. This cost gets passed on to user resulting in affordability issues.

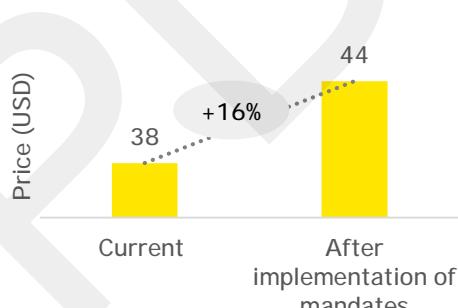
For instance, if the regulations on a mandatory GPS locator and iris scanner came into effect, it is estimated that the prices of entry-level phones would increase by at least US\$3, and as a result, an additional 13 million people would not be able to afford mobile broadband³¹.

Mandates on device specifications can lead to higher price

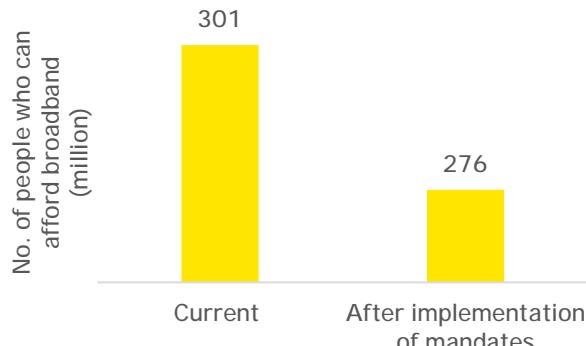


Impact of mandates on device specifications

Change in the price of entry level smartphones after the implementation of new mandates on mobile phone specifications



Change in the number of people who can afford broadband after the implementation of new mandates on mobile phone specifications



Source: Analysys Mason

Besides handsets, routers and modems are fundamental to network connectivity and their local production should also be encouraged. In 2017, a global networking company unveiled its first 'Made in India' router which can be used by small and medium businesses (SMBs) across multiple industries.

Local manufacturing of components would be beneficial for M2M

M2M applications require a large number of sensors and devices. The Make in India program is expected to boost M2M hardware manufacturing in India. The Government of India has already initiated steps to promote indigenous manufacturing. Local manufacturing of components translates into a number of benefits, such as significant reduction in the cost of M2M sensors, modules and devices. It is also important keeping in mind the low-ARPU business model of M2M services. The cost of some of the sensors is so low that it may be unviable to import them and hence they have to be manufactured indigenously.

The Indian sensor-manufacturing segment is one of the fastest growing in Asia Pacific, primarily driven by increased demand for M2M connected devices across industry verticals. Going forward, the segment is expected to grow significantly due to requirement of sensors in automotive and consumer electronic products. In addition, increasing automation and security concerns would also help drive growth in the segment.



06

How can you
aspire to lead in
the digital
economy?

Spiralling Ease of doing business

The World Bank's Doing Business Report 2018 ranked India 100th out of the 190 countries, moving up from 130th a year ago. The government's initiatives and sustained reforms have led the impressive improvement in Ease of Doing Business (EODB) ranking, India is one of the top five reformers, improving its score in six out of ten criteria used by the World Bank for measuring the ease of doing business.

Government's goal is to achieve 50th EODB ranking by 2022. This calls for bold reforms and simplifying the clearance processes, especially in the area of infrastructure project for broadband proliferation.

Catalyzing investments for infrastructure roll-outs

Globally, special funds have been introduced to meet infrastructure roll-out demands. Such funds provide an opportunity to split the tremendous investment required in the digital telecom infrastructure industry between stakeholders. It also provides a consistent return on investment and helps in developing a common telecom infrastructure (infrastructure sharing).

Case study: Thailand Infrastructure Fund

In Thailand, a Digital Telecommunications Infrastructure Fund (DIF, formerly known as TRUE GROW) was established to raise funds from both domestic and foreign investors. It is backed by a leading cellular player in the country. The capital raised is invested in telecommunications infrastructure assets across the country, such as telecommunication towers, fiber optic cable, transmission equipment, broadband, and bandwidth management. DIF is listed on the Stock Exchange of Thailand (SET) since 27 December 2013 and giving a dividend yield of 6%-7%.

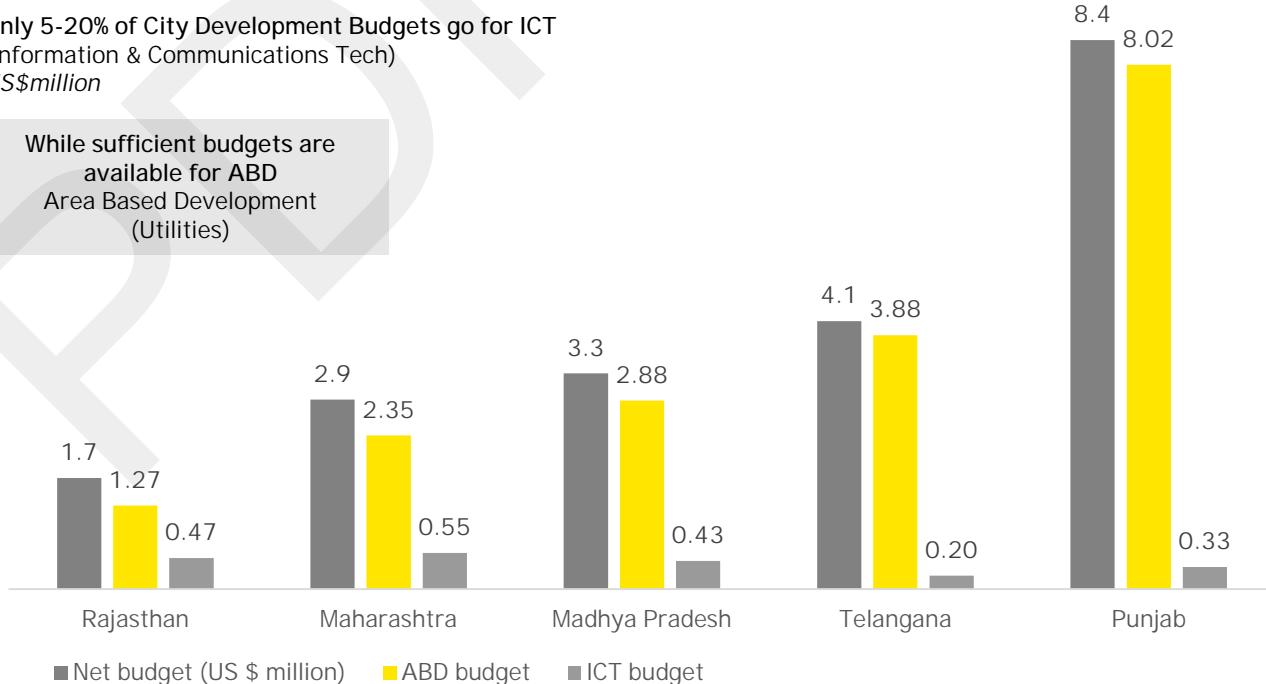
Limited allocation of area based budgets

Most city development funds in India are going to Area based development (ABD) for water, power, and roads infrastructure. Current ICT funds can support only marginal fiber needs but not ubiquitous fiber infrastructure.

Fiber investment needs to be included as priority in basic utility funds

Only 5-20% of City Development Budgets go for ICT
(Information & Communications Tech)
US\$million

While sufficient budgets are available for ABD
Area Based Development (Utilities)



The draft NDCP 18 proposes according Telecom Infrastructure the status of Critical and Essential Infrastructure.

By recognizing communication systems and services as essential connectivity infrastructure at par with other connectivity infrastructure like Roadways, Railways, Waterways, Airlines etc. for development of India, and, in the process, enable low cost financing for development of communication infrastructure

'Infrastructure' status benefits for tower companies

Despite the fact that the telecoms towers have already been granted "Infrastructure status", the benefits (accelerated depreciation, higher ECB limit, eligibility for viability gap funding, lower import duties and excise exemption, softer lending rates, tax holidays) are yet to be provided to the sector.

Need to simplify RoW policies

Establishment of the telecoms infrastructure in India is accompanied by challenges of RoW, that largely stem from fragmented and non-uniform policies adopted by various states and local bodies.

The Gazette Notification on RoW issued by Government in 2016, is an effort to expedite the deployment of underground (fiber cables) and over-ground (telecom towers) infrastructure. However, these new rules are yet to bring benefits to the Indian telecoms sector due to lack of clarity and implementation delays³².

Revised RoW Rules announced in 2016

- ▶ New rules aim at simplifying the grant of RoW permissions by making it a transparent and time-bound process. The rules mandated:
- ▶ Developing an electronic application portal within one year of the roll-out of the rules
- ▶ Single window clearance for applications
- ▶ Fast-tracking decision on RoW permits – within 60 days of filing the application
- ▶ Designation of nodal officers for appropriate authorities
- ▶ Rationalization of administrative expenses across the country (to a maximum of INR1,000 per km for fiber, and INR10,000 per application for overhead towers).

³² "Right of Way rules: The effects of implementation delay on India's telecom industry," The Economic Times, <https://telecom.economictimes.indiatimes.com/news/right-of-way-rules-the-effects-of-implementation-delay-on-india-telecom-industry/59855964>, accessed 23 March 2018.

Five barriers to broadband adoption in India," DQ India, <http://www.dqindia.com/five-barriers-to-broadband-adoption-in-india/>, accessed 26 March 2018.

Implementing a 'Fiber First Initiative' in line with the draft NDCP 2018, DoT has proposed to accord Telecom Optic Fiber cables the status of Public utility

Category	Challenges	Way forward
Right of Way Permissions while laying fiber	<ul style="list-style-type: none"> ▶ Policies of the state governments are not aligned with the central guidelines, resulting in delays in roll-outs ▶ Lack of defined processes, permissions and approvals during the awarding and execution stage of project impacts timelines ▶ RoW process require permissions from varied authorities including Electricity, Gas, Sewerage, Railways, NHAI, causing delays and cost inefficiencies ▶ RoW process requires multiple NOCs and documentation 	<ul style="list-style-type: none"> ▶ Uniform RoW process across utilities ▶ Approvals to be taken within the stipulated time of submission. In case of inaction, deemed approval to come to play. ▶ Standard rates for ROW for cash flow predictability. ▶ A nodal agency to ease multiple permissions required. Single window clearance by leveraging digital to bring transparency and predictability. ▶ Establish common permissions processes for all utility purposes - water, electricity, gas pipes, and fiber ▶ Enable Fiber to ride on utility networks for - roads, power, water etc. on fast track utility corridors
Execution: Digging, Trenching,	<ul style="list-style-type: none"> ▶ Inefficient and uncoordinated digging and maintenance impacts roll out time and life span of fiber 	<ul style="list-style-type: none"> ▶ Adhere to GIS systems and 'call before you dig' and "dig once" policies. ▶ Set up a utility corridor to Optimise roll out including easier ROWs and execution ▶ Optimise execution via collaboration with upcoming utility and infrastructure projects
Activation and Deployment of fiber Approvals	<ul style="list-style-type: none"> ▶ Multiple government personnel currently tasked to approve the same sections of deployment ▶ Significant number of human touch points - leading inefficiencies in time, cost and resource. 	<ul style="list-style-type: none"> ▶ Reduction of approvals by empowering government officials to represent various depts.. ▶ An efficient utilisation of technology for surveillance and documentation ▶ Self-certification to optimize time, resource and cost. Push for audit and high penalty ▶ Automate workflow for interdepartmental approvals and partner portal using ERP systems ▶ Focus on operating from standards and strong SLAs ▶ A transparent vendor selection criteria to be followed

Category	Challenges	Way forward
Quality/ Standardization / Public projects - bids	<ul style="list-style-type: none"> ▶ Lack of standardization in procurement of material ▶ Untraceable fiber network ▶ Training manpower 	<ul style="list-style-type: none"> ▶ Centrally held guidelines on standardisation via repository ▶ Benchmark the minimum quality of fiber and encourage high count ▶ Ensure the utility corridors and duct dimensions accommodates high count optic fiber ▶ Set up of Common GIS platform for management of utilities ▶ Amend building codes to include fiber along with water, electricity, and gas pipelines ▶ Define custodian of the utilities map with the nodal agency for RoWs being the central pillar ▶ Operational challenges associated with the RFP process to be streamlined. ▶ Digitize the document submission, which is current manual. ▶ Timeline of the project should start post permissions like RoW and approvals.
Payment/ charges Need for consistency	<p>On time payments for Predictability of cash flows</p> <ul style="list-style-type: none"> ▶ RoW charging mechanisms vary across cities/states/ municipalities ▶ Current RoW process includes multiple levies and high administrative charges, 	<ul style="list-style-type: none"> ▶ A Single window for payment clearance with defined timelines to be provided ▶ To levy interest, if payment is delayed ▶ Release the remainder payment before network to bring in cash flow predictability ▶ Standard rates for the RoW to bring cash flow predictability ▶ The government to consider adopting issuance of 'Letter of credit'.

Global best practices

Permissions and Approvals	In the US, under "shot clock" rules employed by the FCC, there is a deadline of 90 days for local government bodies to process applications for co-located facilities, and deadline of 150 days for new tower construction If timelines are not met by the local governments local authority is considered to be in violation of the US Communications Act.
Free RoW access	Austria provides free RoW access without an authorisation on public property. For private property, free ROW under conditions of inter alia existing line expansion or existing line unable to jointly use. Germany allows operators of public telecom networks to use thoroughfares free of charge and requires timely update of the infrastructure database. In the Netherlands, municipality must provide operators free access to their infrastructure and promote sharing and coordinate upcoming civil works to minimize civil disruption.
Single window clearance for approvals	In Greece, the EETT (Hellenic Telecommunications and Post Commission) assumes the role of one-stop licensing body, where applications are filed electronically and subsequently forwarded to the various competent authorities and agencies for approvals. The competent authorities are required to respond back to the EETT through the e-portal within four months
Execution Digging, trenching	In the US, both federal and state laws require excavators to notify the respective utility companies before undertaking any digging, trenching, demolishing, boring, or any other earth-moving operation. The FCC has designated a national toll-free number for 'Call Before You Dig'
'Call before you dig' policy	China: Ministry of Housing mandates all developers must deploy FTTH facilities in new constructed and refurbished houses, buildings and communities. Europe: Regulators have already mandated the new constructed and remodelled buildings must equip with high-speed-ready in-building infrastructure. Portugal: Mandates that new buildings and remodelled old buildings must equip at least 2 fibers per home to be shared by operators to avoid monopolisation of in-building infrastructure.
Payment/Charges	The Australian Government: <ul style="list-style-type: none"> ▶ The 'Australian Supplier Payment Code' gives importance to prompt and on-time payment (within 30 days of receiving a correct invoice) for small business suppliers through a set of agreed standards. The Government plans to reduce payment times to 20 calendar days, compared to industry norm of 30 days, starting from July 2019. ▶ Late Payment of Commercial Debts (Interest) Bill 2003 allows interest to be levied on the late payments on contracts ▶ The Government is promoting use of payment cards to ensure faster payments. The UK Government: <ul style="list-style-type: none"> ▶ Under its 'Prompt Payment Policy', introduced in 2015, the UK government provided a statutory guidance for public sector buyers to make payments for undisputed, valid invoices within 30 days. It allows suppliers to claim statutory interest where a public sector buyer defaults.
Payment practices	A US-based telco has been building a 1,700 fiber-count cable for Boston city. UK-based connectivity provider has metro markets with high-fiber count cable (as many as 864 fiber)
Quality	Italian manufacturer of telecoms cables and Hong-Kong-based carrier has laid a 1728-fiber undersea cable, for providing long-distance and international data-transmission services in the Asia-Pacific region, for a 2.8km segment of a 110km metro serving Hong Kong.
High grade/count fiber	

Quality	North America, Western Europe, Japan, South Korea - Mandatory GIS mapping for new fiber deployment
Mapping GIS system	China - Broadband China strategy recommends GIS mapping for all fiber outlay Bangladesh - rolled out a nationwide GIS mapping in 2016 to support public or private infrastructure South Africa - With Government's support, private players follow GIS mapping as well as display the roll-out status
fiber Installation standard	In 2001, standard established on installation of equipment in a "neat and workman like" manner. It is also used in creating proper project documents such as a statement of work (SOW), request for proposal (RFP) or request for quote (RFQ) on any fiber optic project.

India Initiative

RoW	<ul style="list-style-type: none"> ▶ Maharashtra gave Mahanet the status of an 'important public purpose' project ▶ The state cabinet waived off permissions and extended several exceptions to expedite roll-outs: <ul style="list-style-type: none"> ▶ Permissions required to dig roads waived off ▶ Permission to use any existing infrastructure for laying the optic fiber waived off ▶ Any charges for local bodies seeking to allow the department to use its infrastructure waived off
Maharashtra Mahanet	
Execution Digging, trenching	Gujarat Gas Limited, India's gas distribution company, follows the approach (notification before digging) to avoid any damages to their natural gas pipelines.
'Call before you dig' policy	
Telangana T-fiber	<ul style="list-style-type: none"> ▶ Optic fiber being laid alongside the state government's drinking water pipeline project Mission Bhagiratha. ▶ Separate ducts are being laid alongside the water pipelines, helping reduce the expenditure ▶ Multiple initiatives to enhance usage: Tele-medicine, e- learning
Approvals	GeM, an online portal for procurement of goods and services by various government departments and Tarang Sanchar - a web portal for information sharing on mobile towers and EMF emission compliances
Government e-marketplace (GeM), Tarang Sanchar	The digitalization of paper-based and manual processes ranging from ordering through to invoice capture and processing, permissions and approval, posting, to payments, not only result in operational efficiencies in terms of time, cost and documentation but also significant public sector savings.
Standards	<ul style="list-style-type: none"> ▶ Central Electricity Authority (CEA) laid down the regulations 2010 (amended in 2015), specifying the technical standards for Construction of Electric Plants and Electric Lines. ▶ The regulations govern standards related to construction, metering, grid operations, connectivity and transactions of business regulations. In addition, CEA has also developed standards related to safety
Power sector	

Summary of key considerations:

Expediting fiber deployments

'fiber First' policy

- ▶ A Fiber First policy to give due importance to fiber deployments across India.
- ▶ Consider deployment of Common Telecom Infrastructure during construction of new highways, roads and civil infrastructure

Standardizing fiber deployments

Future ready fiber roll out

- ▶ The suggested National Fiber Authority in the Draft NDCP 2018 should be the custodian of Centrally held guidelines and standards documents and also have to power to audit the networks. The authority should:
 - ▶ Ensure the utility corridors and duct dimensions has the capacity to accommodate high count optic fiber-
 - ▶ Encourage utility providers to create provisions for fiber duct in the utility corridor being planned.
 - ▶ Amend building codes to include fiber along with water, electricity, and gas pipelines
 - ▶ Ensure an RoW nodal agency for all utilities
- ▶ Fiber Action Task Force (FATF), with cross ministry and industry involvement, should be initiated to ensure standards for the creation, procurement, deployment and management of fiber
- ▶ Benchmark the minimum quality of fiber and encourage high count

Address financial challenges to reduce cash flow predictability issues

Ensure on-time payments to avoid any roll-out delays

- ▶ A Single window for payment clearance with defined timelines should be provided
- ▶ Release the remainder payment before network to bring in cash flow predictability
- ▶ Government payment system must levy interest, if payment is delayed-
- ▶ Encourage streamlining for interdepartmental approval process through automation to allow timely approvals and SLA monitoring
- ▶ Standardize rates for the RoW to bring in cash flow predictability
- ▶ The government should adopt issuance of 'Letter of credit' as payment method.

Address Operational Challenges to fast track deployment of networks

'Simplifying RoW rules and introducing a unified policy across states and cities

- ▶ Uniform RoW process across utilities-cover in point of nodal agency
- ▶ Approvals to be taken within the stipulated time submitted . In case of in action, deemed approval to come into play.
- ▶ Uniform pricing: Rationalizing RoW charges across states/cities considering the cost of restoration of road or damaged facilities and levying charges depending on city types (Metro, Class-A, Class-BA nodal agency to ease the multiple permissions required and to drive project from customer side for smooth operation.
- ▶ A single window clearance by leveraging digital to bring transparency and predictability.

Reduce number of approvals and focus on audits for increased accountability

- ▶ Utilize technology for surveillance and documentation
- ▶ Self-certification to optimize time, resource and cost.Push for audit and high penalty
- ▶ Automate workflow for interdepartmental approvals and partner portal using ERP systems.
- ▶ Follow a transparent vendor selection and approval process

Standardize RFPs, tender documents and award process to save on time and money

- ▶ Operational challenges associated with the RFP process to be streamlined.
 - ▶ Digitize the document submission, which is currently manual.
 - ▶ Timeline of the project should start post permissions like RoW and approvals.

Adopt "Dig once" and "Dig safe" policies

- ▶ Construct utility corridors in new roads and infrastructure so that all utilities (including gas, water and fiber) are laid together leading to reduced effort, time and cost of RoW
- ▶ The 'common duct policy' for which the pilots are being conducted, is a step in the right direction and would help reduce operational costs by eliminating the need for frequent digging up of roads
- ▶ Adopt 'Call Before You Dig'/'Dig Safe' policy which should encourage notifying all concerned utilities before digging process begins, to prevent any damages or fiber cuts

Utilize assets of other infrastructure providers

- ▶ Foster partnerships with public sector units to lay fiber cable in their existing utility corridors, speeding up the overall execution as PSUs already have RoW clearances and digging is not required in this case
- ▶ Incentivize utilities infrastructure like power, water, gas to include ducts and optical fiber networks as part of the new infrastructure
- ▶ Encourage real estate developers to partner with ducts or trenches or right to lay fiber at pre-specified rates

Catalysing investments for infrastructure roll-outs

Budgetary allocation in the Union Budget towards broadband infrastructure, similar to roads, railways, defence

- ▶ Allocate part of annual spending on network infrastructure in the Union Budget, similar to other sectors such as education, health and defence

Boosting local manufacturing of OF and OFC,

Build India into a Fiber capital of the world by incentivising domestic manufacturing for global and local demand

- ▶ Reduce the GST to 12% from current 18%
- ▶ Evaluate Comprehensive Economic Partnership Agreement (CEPA) and FTA for the fiber industry
- ▶ Renegotiate Preferential Trade Agreement/Regional Trade Agreement on imports of OF/OFC
- ▶ Increase export incentives from 5% and All Industry Rate (AIR) Duty Drawback to 3% from 1%
- ▶ Introduce tax benefit by way of accelerated depreciation for Capital expenditure and weighted deduction for operating expenditure including for new employment generation
- ▶ Increase in capital subsidy to 40% for units engaged in OF/OFC manufacturing under MSIPS

'Promote and incentivize R&D

- ▶ Extend tax benefit on R&D expenditure of 200% for minimum of 5 years
- ▶ Fast-track evaluation of patent applications to 1-2 years from 4-5 years

Create a market development fund

- ▶ Consider an Optical fiber Market Development Fund to incentivise product development expenses for fiber export and market development expenses towards setting up a supply chain ecosystem including warehousing and logistics networks to counter local incumbents in overseas markets-included above

Maintenance of laid-out fiber infrastructure

Make maintenance practical

- ▶ Encourage a common GIS platform for maintenance and management of utilities. The nodal agency for RoW can be the custodian of the utilities maps and make ABD (As Built Drawing) mandatory

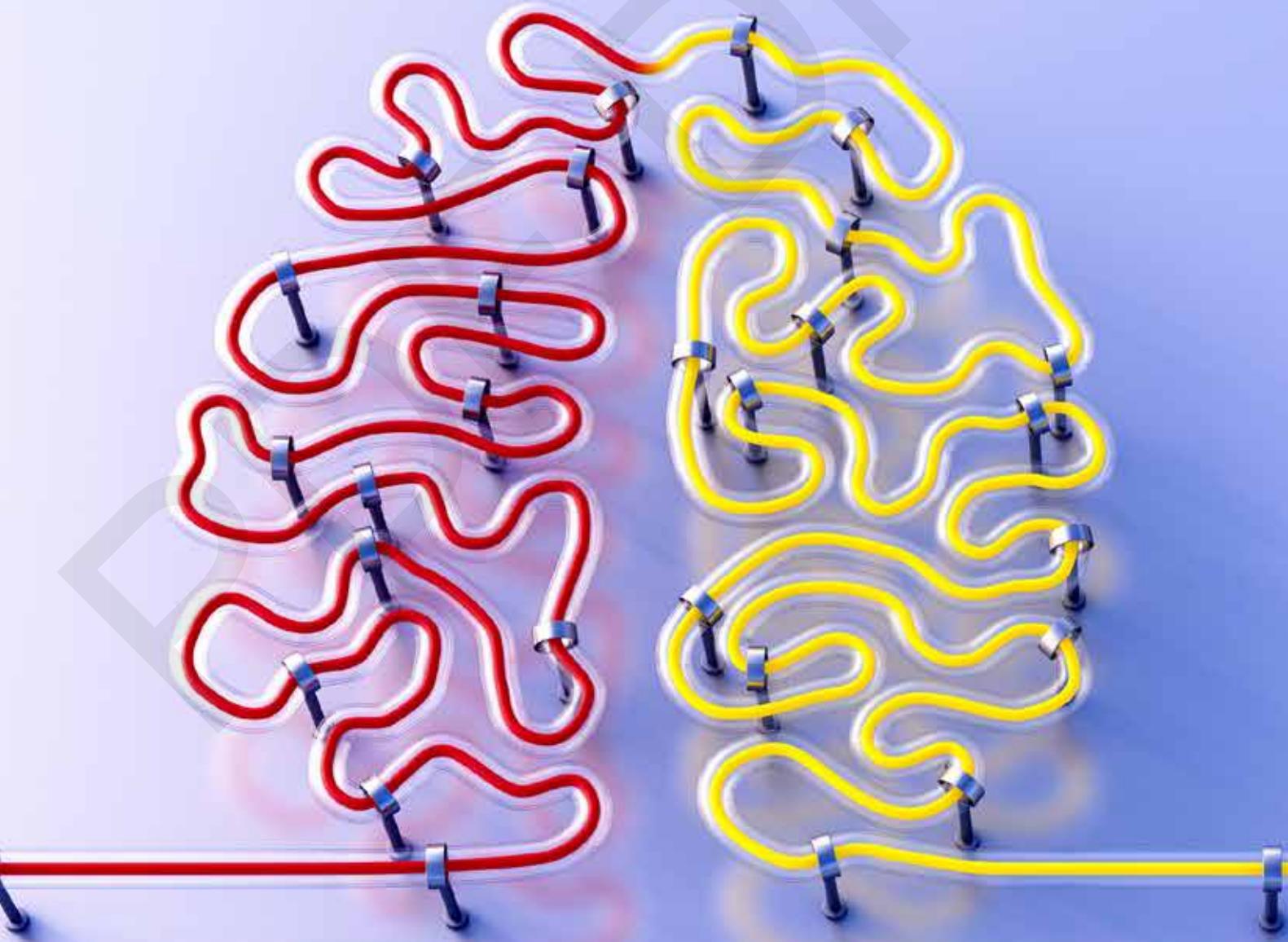
Boosting local manufacturing of telecom equipment

'Making India self-sustaining and export hub, by focusing on domestic production, increasing exports

- ▶ Making Telecom Equipment Manufacturing policy an integral part of the New Telecoms Policy.
- ▶ Rationalising taxes, levies and differential duties to incentivize domestic manufacturing of telecom equipment to the extent of domestic value addition
- ▶ Attracting Global OEMs and Generic Component players to setup manufacturing base in India
- ▶ Promoting R&D and innovation in the country

Ensuring strict compliance to Preferential Market Access requirements

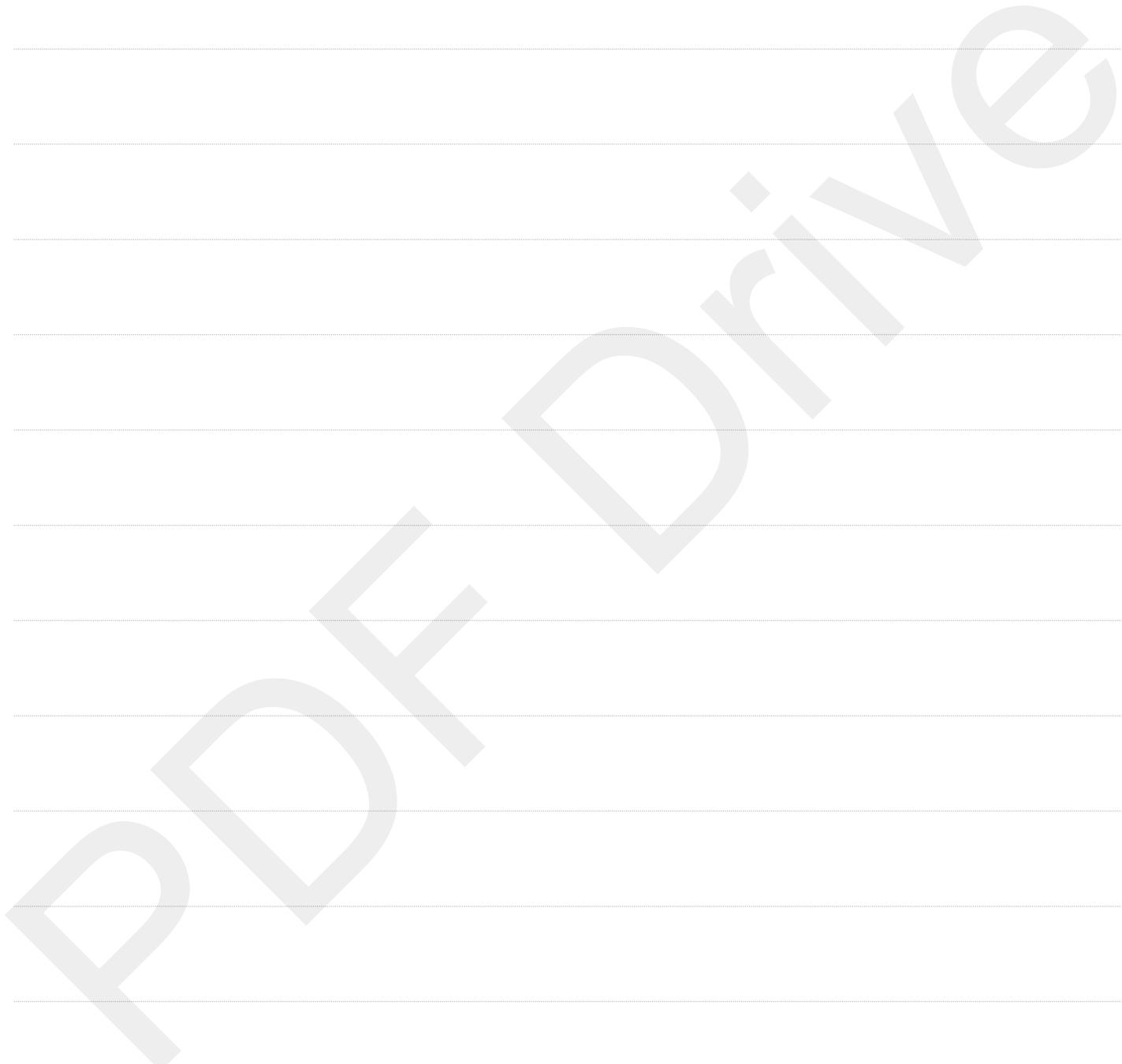
- ▶ Preferring domestic products and services with domestically owned IPR in the procurement by government agencies
- ▶ Incentivizing private operators to buy domestic telecom products



Glossary

Abbreviation	Full Form	Abbreviation	Full Form
ABD	Area based development	GPS	Global Positioning Systems
AI	Artificial Intelligence	ICT	Information and Communication Technology
AIR	All Industry Rate	IoT	Internet of Things
AR	Augmented Reality	IP	Internet Protocol
ARPU	Average revenue per user	IPR	Intellectual Property Rights
ASP	Average Selling Price	ISP	Internet Service Provider
B2B	Business to Business	IT	Information Technology
B2C	Business to Consumer	ITU	International Telecommunication Union
BCD	Basic Customs Duty	LTE	Long Term Evolution
BFSI	Banking, Financial Services and Insurance	M&E	Media & Entertainment
BIS	Bureau of Indian Standards	M2M	Machine to Machine
BRICS	Brazil, Russia, India, China and South Africa	Mbps	Megabits per second
BYOD	Bring your own Device	MNO	Mobile Network Operator
CAGR	Compound Annual Growth rate	MOU	Memorandum of Understanding
CAPEX	Capital Expenditure	M-SIPS	Modified Special Incentive Package Scheme
CEA	Central Electricity Authority	NBC	National Building Code of India
CEPA	Comprehensive Economic Partnership Agreement	NDCP	National Digital Communications Policy
CO2	Carbon Dioxide	NOC	No objection certificate
CPE	Customer Provided Equipment	OEM	Original Equipment Manufacturer
CPSU	Central Public Sector Undertaking	OF	Optical fiber
DOT	Department of telecommunications	OFC	Optical Fiber Cable
DSICOMS	Distribution Companies of India	OTT	Over the top
EB	Exabytes	PAN	Permanent account number
ECB	External Commercial Borrowings	PMP	Phased Manufacturing Programme
EMC	Electronics Manufacturing Clusters	PPP	Public private partnership
EODB	Ease of doing business	PTA	Preferential trade agreement
ESDM	Electronic System design and manufacturing	R&D	Research and Development
FATF	fiber Action Task Force	RFP	Request for proposal
FCC	Federal Communications Commission	ROI	Return on Investment
FMCG	Fast moving consumer goods	ROW	Right of way
FTA	Free-trade agreement	RTA	Regional Trade agreement
FTTH	Fiber to the home	SDG	Sustainable Development Goals
FTTX	Fiber to the X	SKD	Semi-knocked down
G2C	Government to citizen	UPI	Unified Payment Interface
Gbps	Gigabits per second	USOF	Universal Service Obligation Fund
GCI	Global Connectivity Index	VHA	Virtual Health Assistant
GDP	Gross Domestic Product	VoD	Video on demand
GIS	Geographic information system	VR	Virtual Reality
GNI	Gross National Income	WTO	World Trade Organization
GP	Gram Panchayats	YoY	Year on Year

Notes



Notes



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