



Broadband for inclusive development—social, economic, and business

November 2020

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Foreword



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Broadband is a critical lever for the growth of our knowledge economy and acceleration of our development across social, economic, and business indicators. Broadband has the ability to touch and impact the life of every citizen by enhancing convenience, improving accessibility to quality services (e.g., health care, education, and banking), and providing employment avenues.

India has witnessed significant progress in broadband in the last three years, primarily on the back of smartphone growth and low data prices. In the next innings, broadband penetration in rural areas and mass adoption of fixed broadband hold the anchor to continue and accelerate this growth trajectory.

COVID-19 has fuelled the need for high-speed, reliable broadband across all our daily activities—working, learning, seeking information and entertainment, and buying products and services. Every aspect of our lives has been connected virtually, driving exponential growth in data consumption and a multi-fold increase in mobile and fixed broadband demand. If we analyse COVID-19 infused trends alongside our young demographics, we believe

that a large part of this digital behaviour is expected to continue. COVID-19 has got us to an inflection point at an unanticipated pace; and now presents an opportune moment to accelerate our broadband growth.

There are, however, a few aspects to be addressed to ensure potential broadband growth in the most effective manner—right of way issues, cost of infrastructure deployment, levels of digital literacy, and access to affordable devices being key examples. The government, telecom service providers, the regulator, and all key stakeholders in the value chain must contribute to addressing these challenges.

This report briefly highlights the state of broadband in our country, how critical and transformative broadband can be for us, the key challenges holding back its growth potential, and certain key interventions that can be made through government policies, government spending, impetus to R&D and product development, and effective on-ground implementation of large initiatives.

We hope that you find this report insightful and enriching!

Message from CII



Mr Umang Das

Chairman

CII TELECOM Convergence Summit 2020

When India moved into lockdown to protect against COVID-19, fixed broadband networks took on the lion's share of responsibility for keeping the world connected, driven primarily by working from home (video conferencing and collaboration, VPNs), learning from home (video conferencing and collaboration, e-learning platforms) and entertainment (online gaming, video streaming, social media).

Broadband service providers dealt with the immediate challenge very well but now need to consider the long-term implications for their networks. The changes in digital behavior are likely to continue, with many more people relying on their home connectivity until a vaccine is found.

However, COVID-19 has exposed shortcomings that competitive networks do not adequately address. This should galvanize policymakers to address serious gaps in rural infrastructure, affordability for low-income users, and at-home access for working community, student and others.

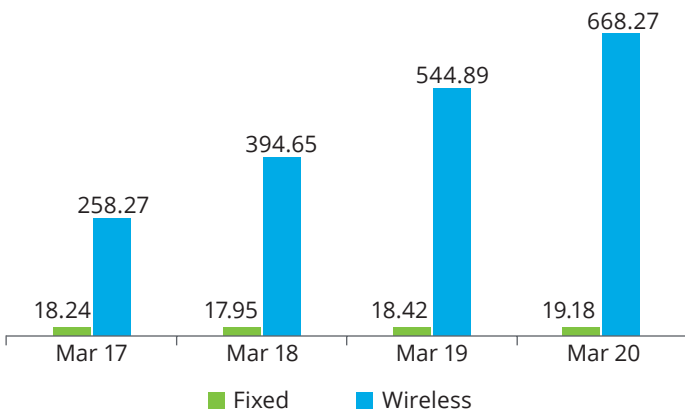
To add on, we should not change what works. Reliance on facility-based competition and light-touch regulation set the stage for the consistent, above-average private investment that would sustain India's broadband networks through this crisis.

The state of broadband in India

India witnessed a significant rise in its broadband users with the number surpassing 687 million^[1] (i.e., broadband penetration of more than 51 percent) in March 2020.

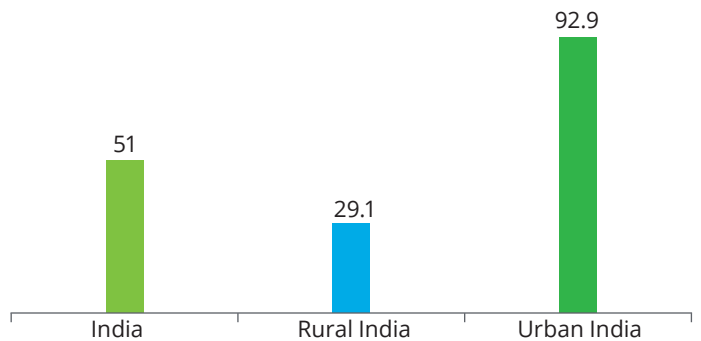
The low penetration rate of India’s rural areas highlights the significant opportunity for more inclusive broadband growth.

Total broadband subscribers (million)



Source : TRAI, Deloitte Analysis

Percentage of population with broadband connectivity in India



Source : TRAI, Deloitte Analysis

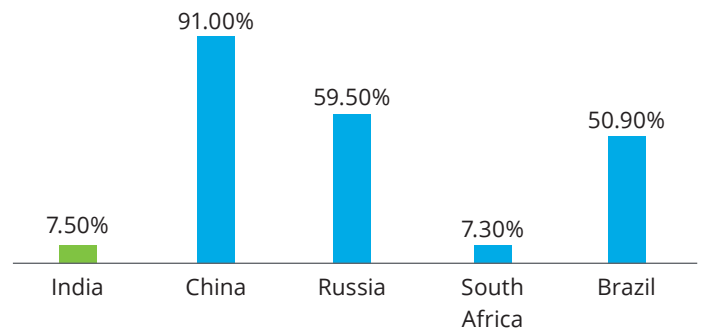
Broadband connectivity is considered a key lever in the economic and social development of a country. A 35 percent annual growth rate of broadband^[1] subscribers presents an encouraging sign for India. Broadband consumption in India has accelerated on the back of increasing smartphone penetration and low data prices, with 1 GB wireless data costing US\$0.15 (as of March 2020)^[1], the cheapest in the world. This has also resulted in India being one of the largest internet consumers in the world.

Rural India’s broadband subscribers per 100 population increased from 12.0 in March 2018 to 29.1 in March 2020^[1] and continues to show significant opportunity for growth

A wireless data user in India consumed 11 GB data per month as of March 2020, one of the highest in the world^[2]

However, it is important to note that as per TRAI data for March 2020, 97 percent of broadband users in India are wireless, and only 3 percent subscribe to fixed broadband^[2]. This presents a significant opportunity for growth.

Percentage of households with fixed broadband access

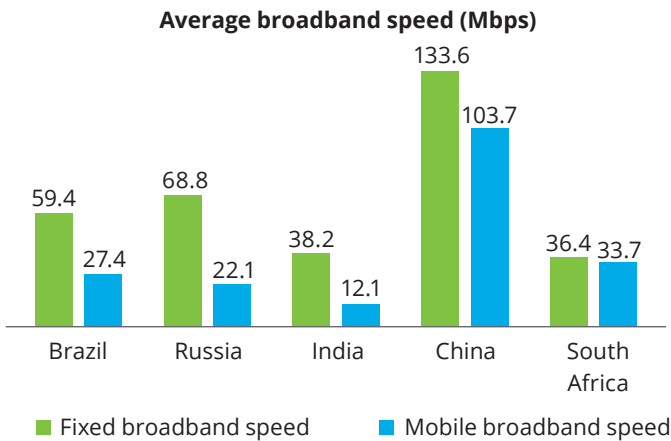


Source : World Bank Data, United Nations Data, Deloitte Analysis

Fixed broadband penetration in India is at only 7.5 percent of our households, which presents a significant opportunity for growth^[3].

While India has made significant development in broadband speeds over the years, there is a large scope for growth in speeds, which can enable further growth of technology platforms, social development programmes, businesses, and economic growth.

India’s telecom policy defines a minimum speed requirement of 0.512 mbps to qualify as broadband internet, with the TRAI recommending an increase to 2 mbps^[4]



Source : TRAI Consultation Paper on ‘Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed’ Data as of June 2020

Broadband coverage and quality play a crucial role in accelerating social inclusion and our journey towards a knowledge based economy that promotes entrepreneurship and digital skills. Countries across the globe have acknowledged the importance of broadband and set ambitious targets in terms of broadband coverage and minimum speeds.

The COVID-19 effect: Impetus to broadband, especially fixed broadband

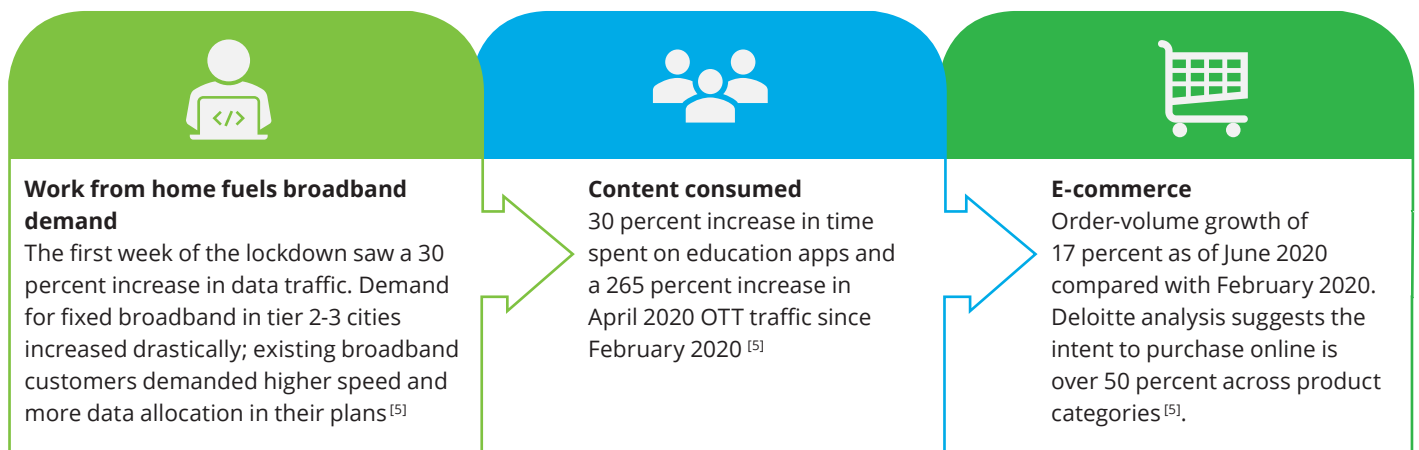
The COVID-19 pandemic has further accelerated India’s already rapid pace of data consumption and broadband penetration.

July-Sep 2020 quarterly results of a leading telco indicate a 2.1x growth in fixed broadband connections compared to the Jan-Mar 2020 quarter, and a 15x increase compared to the same quarter last year

As a result of the lockdown, digital services such as e-commerce, online education, online entertainment, and e-payments have seen a significant increase in consumption across the country. The rapid shift to work from home led to Indian users demanding connectivity 24x7 through multiple devices.

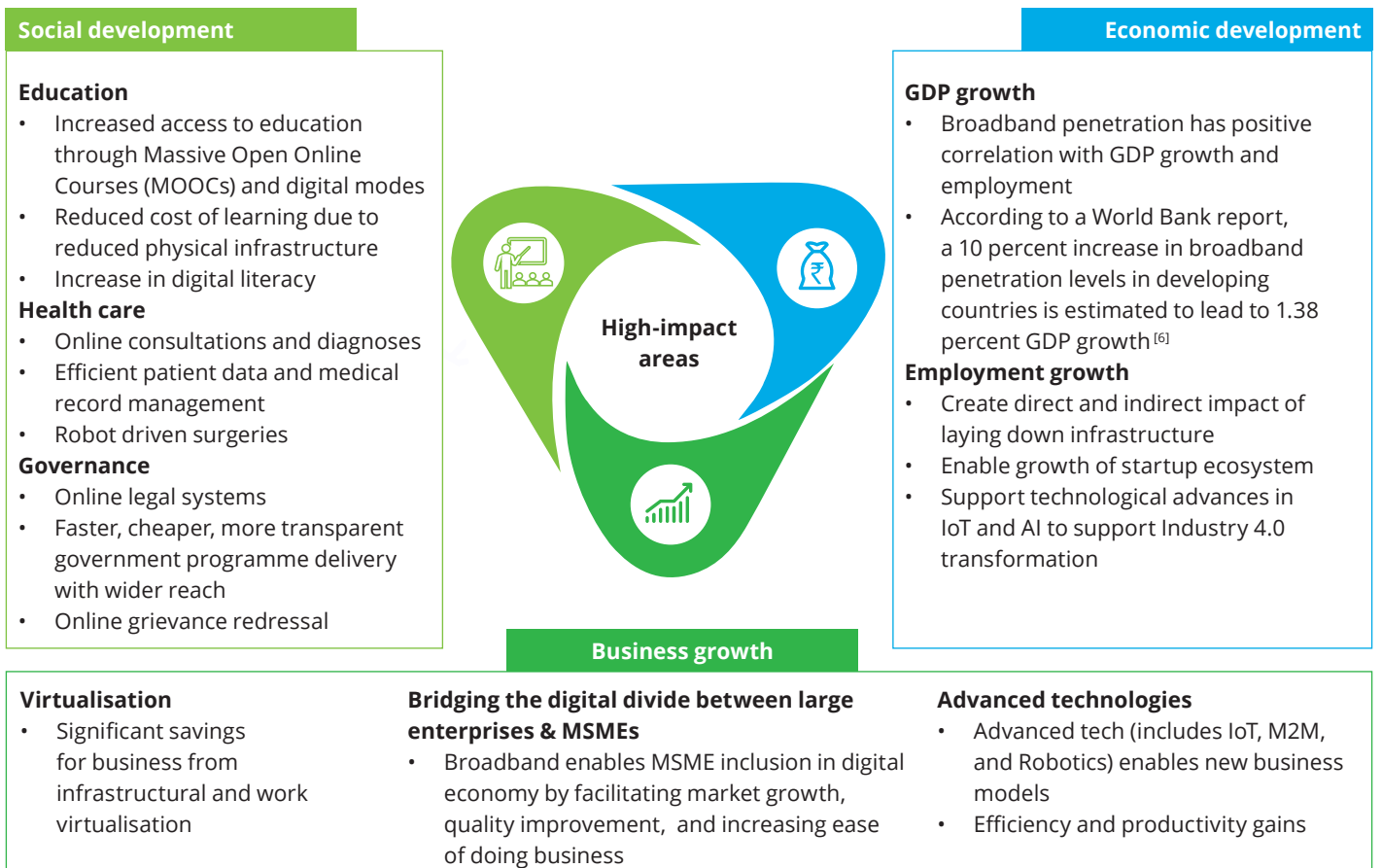
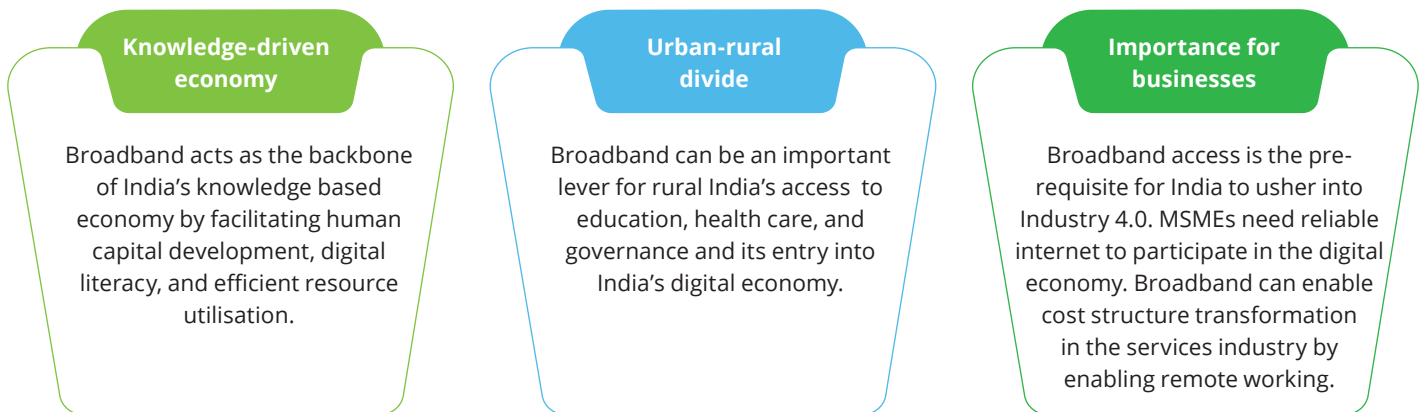
This has also fuelled the need for fixed broadband, driven by work from home, learning from home, entertainment (online gaming, video streaming). Significant increase in demand for fixed broadband is estimated to continue, as a result of the pandemic, with extension in work-from-home for most corporates and permanent changes in digital behavior of people in the new normal.

The pandemic has also brought to the fore the vital role the telecommunications industry plays in the economy. India has been reliant on the sector to facilitate remote business operations, work from home setups, and access to essential services. It has allowed Indians to consume entertainment and essential services and products digitally from the safety of their homes. Indian telecom infrastructure has supported significant peaks in internet traffic post the onset of the pandemic.



The transformational potential of broadband

Broadband has the potential to transform social, economic and business growth. It has become as much a necessity as food, water, and shelter. Broadband has and will continue to become an increasing part of citizens' day to day life, enabling commerce, education, health care, governance, and other social goods..



The state of India’s social sector and the potential of broadband

India has made significant strides along key social indicators, and broadband can enable further progress (for e.g., by enabling greater access to quality health care, education and financial services, with a focus on rural India)

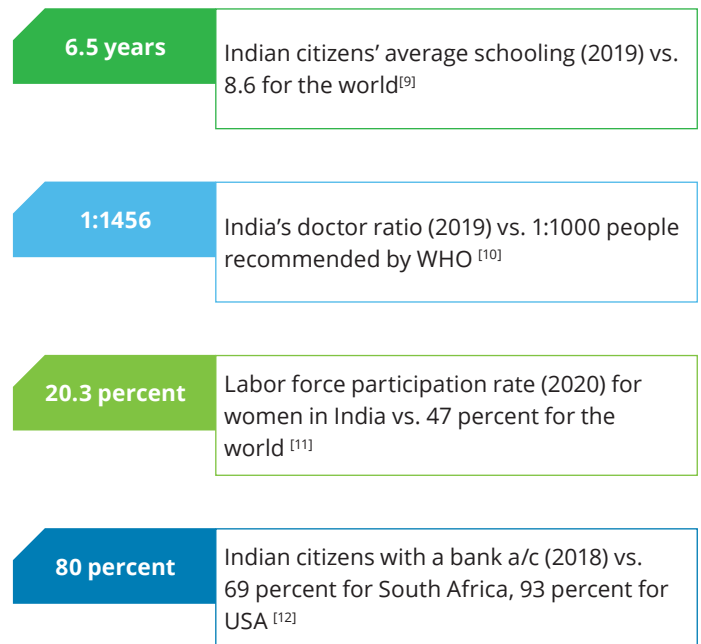
India has witnessed tremendous growth in the past few years and can leverage broadband to make our growth more inclusive. Digital technologies, due to their capability to significantly reduce the cost and improve the quality of delivering these social goods, act as a game changer for inclusive growth.

It is important to note that for digital technologies to develop and operate smoothly at scale, high-speed and reliable broadband is a pre-requisite. As India and the world progress towards 5G, significant opportunities for accelerating inclusive growth lie ahead.





India’s social development landscape

India has made significant progress along the key social development indicators. Under the Pradhan Mantri Jan Dhan Yojana, India has made great strides in furthering financial inclusion. 80 percent of Indians now have a bank account in their name ^[7]. Now next leap of continued social development requires replication of same success to other areas like health care and education; at an accelerated pace (for e.g., in health care, India’s overall doctor to people ratio and rural India doctor to people ratio stands at 1:1456^[8], and 1:4500 respectively, vs. 1:1000 recommended by the World Health Organization). Broadband can be the fuel for this acceleration.

Social indicators: Significant progress over last few years with need for continued & sustained focus to unlock full potential for improvement and growth



Key areas where broadband can impact

 <p>Access to infrastructure Overcome long distances of travel to hospital, banks and schools by squaring off deficit of physical infrastructure with wider access to digital infrastructure.</p>	 <p>Quality and affordability of health care Increase access to quality health care and health advice at a lower cost – preventive, diagnostic and corrective medical aid.</p>	 <p>Quality and affordability of education Mitigate challenges of faculty bandwidth, cost of higher education, timely access to new curriculum, and access to sources for quality research.</p>	 <p>Workforce diversity Increase participation of women in the workforce, which may lag due to mobility restrictions, social and cultural stigma, safety issues.</p>
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Broadband as an enabler for India's societal development

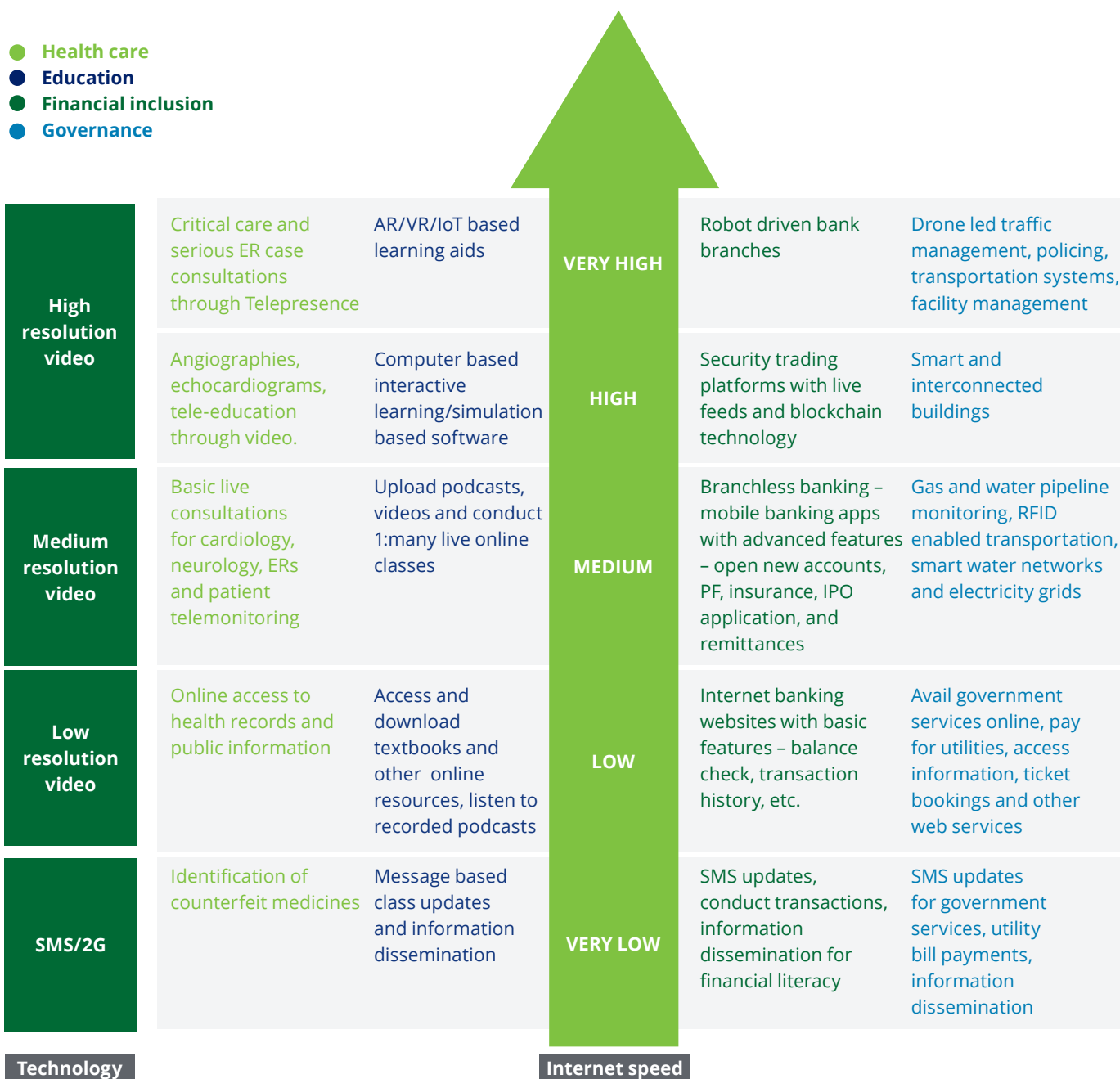
Ubiquitous broadband coverage can play a transformative role in improving access to health care, education and financial inclusion and unlock potential by enabling technological advances

Broadband can act as a key enabler and contributor to the accessibility and affordability of social goods such as education, health care, financial services, and an inclusive society.

Broadband speeds and reliability are important parameters as higher speeds impact customer experience which can trigger adoption of various applications.

As broadband speeds increase, more technologies become available for widespread use. The importance of broadband as an enabler is further highlighted as India moves towards Industry 4.0, with greater focus on new-age technologies such as machine to machine communication, Internet of Things, telemedicine, etc.





Varying broadband speeds can support variety of applications that can be used in different sectors



Source: Secondary Research, Deloitte Analysis






Broadband-driven government initiatives for inclusive growth in society

Reliable broadband connectivity is crucial to the success of many initiatives launched by the government of India to improve the state of social inclusion, infrastructure, and affordability

 <p>Health care</p>	<p>Pradhan Mantri Jan Arogya Yojana ^[13]</p> <p>Provide health assurance cover of INR 5 lakh per family to over 50 crore beneficiaries i.e. bottom 40 percent of the Indian population. Specially focuses on cashless transactions</p> <ul style="list-style-type: none"> • 12.6 crore e-patient cards issued • 1.1 crore cashless treatments • 22k hospitals empaneled 	<p>National Digital Health Mission ^[14]</p> <p>NDHM aims to create a national digital health ecosystem that supports universal health coverage in an efficient, accessible, inclusive, affordable, timely and safe manner, that provides a wide-range of data, information and infrastructure services, duly leveraging open, interoperable, standards-based digital systems, and ensures the security, confidentiality and privacy of health-related personal information.</p>
 <p>Education</p>	<p>PMG Disha ^[15]</p> <p>Aims to make 6 crore rural citizens digitally literate i.e. emails, digital payments, government services, typing, and browsing, etc. Training centres to be set up in gram panchayats</p> <ul style="list-style-type: none"> • 254,897 training centres registered • 2 crore candidates completed training 	<p>PM eVidya ^[16]</p> <p>Provides access to online education tools through media such as dedicated TV channels, radio, podcasts, online courses, and specialised content for visual and hearing impaired</p> <ul style="list-style-type: none"> • 34 TV channels for 24*7 educational content • 2,92,268 titles
 <p>Financial Inclusion</p>	<p>Pradhan Mantri Jan Dhan Yojana ^[17]</p> <p>To ensure access to financial services – basic savings account, insurance, credit, payments, pension, and benefit transfer. Bank accounts opened with branches or by bank mitras (agents)</p> <ul style="list-style-type: none"> • 40.91 crore beneficiaries added • 30.01 RuPay debit cards • 129K Crore in deposits 	<p>UPI – Unified Payments Interface ^[18]</p> <p>A payments system that integrates users’ bank accounts into one mobile application, enabling instant transfer of funds through unique UPI ID or phone number, without needing lengthy processes to add beneficiaries</p> <ul style="list-style-type: none"> • 3,29,027 crore in transactions • 174 banks live on UPI
 <p>Inclusive Workforce</p>	<p>Pradhan Mantri Kaushal Vikas Yojana ^[19]</p> <p>Provide short term industry specific trainings along with placement support by establishing dedicated training centres across the country</p> <ul style="list-style-type: none"> • Rs. 12,000 crore budget allocated • ~33,00,000 candidates enrolled • 22,550 training centres 	<p>Stand Up India ^[20]</p> <p>Capital accessibility by facilitating loans up to INR 1 crore through branches and online modes to SC, ST, and women for starting a manufacturing, services, or trading enterprise</p> <ul style="list-style-type: none"> • 1,00,000+ bank branches enrolled • 95,400 loans sanctioned till date
 <p>Governance</p>	<p>Smart City Project ^[21]</p> <p>Use technology to reduce costs of and improve public infrastructure, government services, quality of life in cities</p> <ul style="list-style-type: none"> • 9.9 crore urban population impacted • 2,05,018 crore total cost of projects 	<p>e-courts ^[22]</p> <p>e-courts envisages providing efficient & time-bound citizen centric services and developing, installing & implementing decision support systems in courts. Other aims include enhancing judicial productivity, both qualitatively & quantitatively, making the justice delivery system affordable, accessible, cost effective, predictable, reliable and transparent.</p>

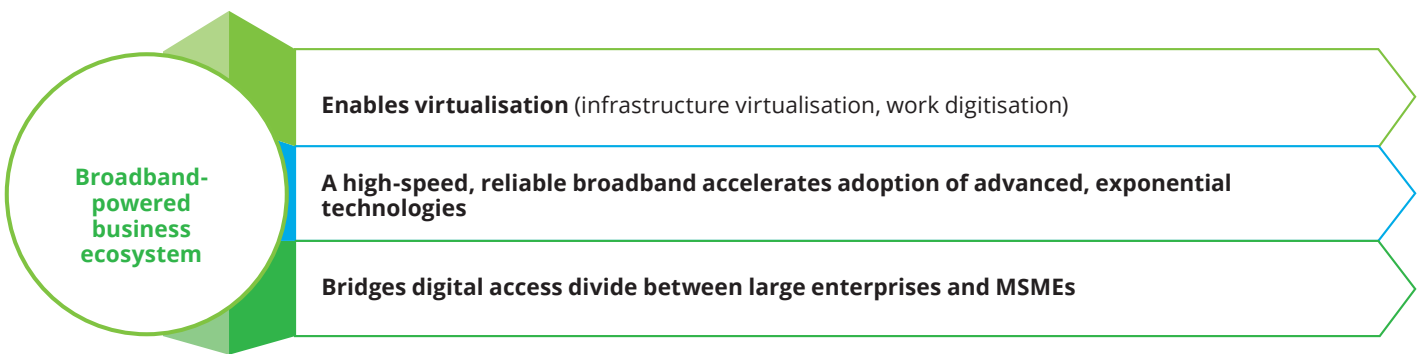
Innovative solutions by technology start-ups, the private sector, and NGOs

New-age technology start-ups (with innovative business models) and NGOs are taking advantage of India's growing broadband penetration and tackling problems in the social sector with creative solutions

 <p>Health care</p>	<p>Not-for-profit health care organisations</p> <p>Not-for-profit health care organisations are providing health access to the underserved by setting up tech-enabled health camps and treatment centers in rural areas at highly affordable costs and low travel distances.</p>	<p>Tele-medicine and medicine delivery start-ups</p> <p>Multiple start-ups have come up to provide and act as a one stop shop medicine delivery, online doctor consultations, home lab tests, thereby leveraging increasing internet connectivity to increase digital health access.</p>
 <p>Education</p>	<p>Online coaching and classes</p> <p>Start ups have come up in the online education space to provide education for classes 6 to 12, competitive exams such as JEE, NEET, CAT, IAS, GRE, and vocational skills such as coding, web designing, accounting, etc.</p>	<p>Massive Open Online Courses ^[23]</p> <p>MOOCs are free courses offered by esteemed education institutes. 110 Million people enrolled for MOOCs globally in 2019.</p>
 <p>Financial Inclusion</p>	<p>Financial literacy programmes by Non-Government organisations and Not-For-Profit organisations</p> <p>Multiple NGOs and not-for-profits are conducting programs in rural areas, with many of these targeted towards women, to teach basic financial concepts such as budgeting, savings, debt management. The mode of delivery of the learning across all the organizations is technology enabled.</p>	<p>MSME-focused finance and lending organisations</p> <p>There are multiple technology driven lending start-ups in the Indian ecosystem today that focus on micro and small enterprises. Most start-ups also provide some degree of training and education to MSME entrepreneurs to teach them how to channel these funds effectively.</p>
 <p>Inclusive Workforce</p>	<p>Vocational training institutes</p> <p>Recognizing the power of vocational skills in increasing employability, multiple players in the ecosystem, both private and non-Government, are using technology to deliver skills that allow people to work in jobs such as nurses, accountants, logistics, and many more such areas</p>	<p>Food delivery and vocational skill start-ups</p> <p>Increasing smartphone usage and internet penetration has enabled the rise of food delivery start-ups that directly employ several lakh people as food delivery riders. Other such start-ups across skills such as home cleaning, plumbing, car repair, carpentry, etc., are also increasing employment opportunities for people</p>
 <p>Governance</p>	<p>Corporate initiatives for governance</p> <p>Multiple initiatives from some of India's biggest corporate houses undertake projects to enhance information sharing systems, governance solutions, utility services delivery</p>	<p>Governance and civic-tech start-ups</p> <p>Multiple civic-tech start-ups today develop and provide technology solutions to governments to enable cheaper and more efficient administration. Such initiatives are the heart of the Smart City initiative</p>

Impact of broadband on India's business sector

Broadband infrastructure enables roll out of digital technologies which may improve business performance and efficiency. It also enables bridging of the digital access divide between large enterprises and MSMEs.

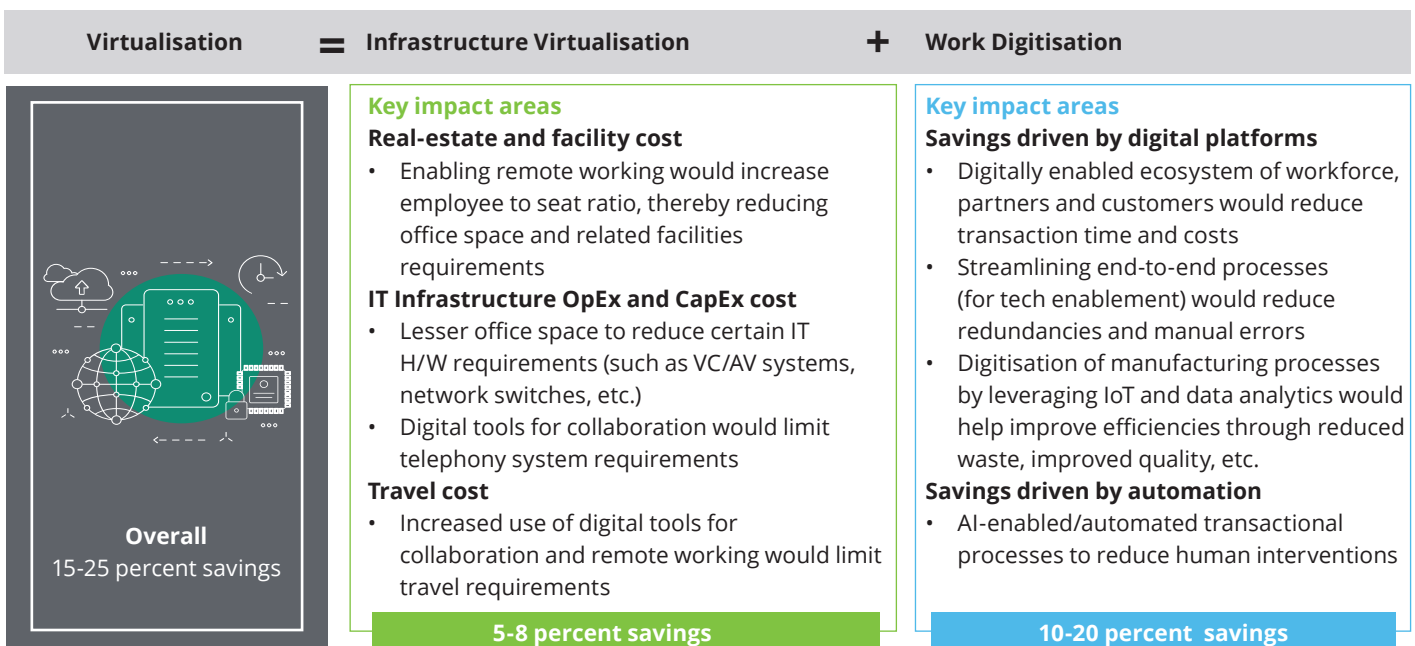


Virtualisation

The transition to a Work from Home model as a result of the pandemic led to an adoption of virtualisation, enabled by a reliable and stable broadband connection. 'Infrastructure virtualisation' and 'work digitisation' have the potential to provide overall savings of up to 15-25 percent for businesses.

Infrastructure virtualisation enables businesses to lower capital outlay and operational costs while improving operational efficiency and flexibility as well as streamlining processes.

Work digitisation refers to the 'always connected' workplace in which employees are communicating and collaborating in unprecedented ways. By integrating technologies that employees use (e-mail, instant messaging, HR applications, etc.), the digital workplace breaks down communication barriers, positioning the business to transform the employee experience by fostering efficiency, innovation and growth.

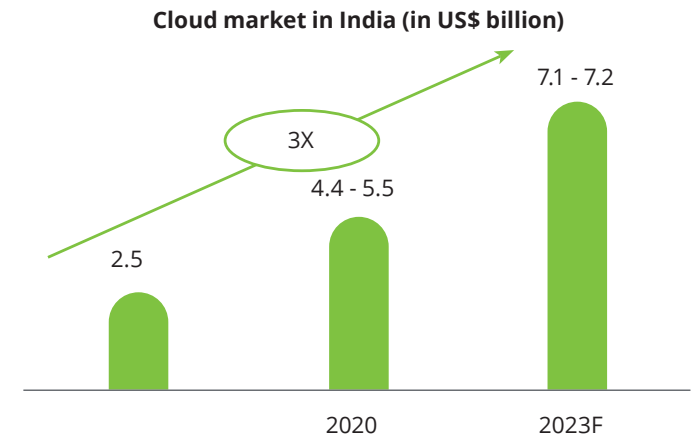


Source: Secondary Research, Deloitte Analysis

High-speed, reliable broadband accelerates the adoption of advanced and exponential technologies

Recent developments in the technology sector in India have accelerated disruptive technology adoption. The cloud market in India has almost doubled from US\$2.5 billion in 2018 to US\$4.5 billion in 2020 and is set to grow to approximately US\$7 billion by 2023 ^[24].

According to the Deloitte Internet of Things study, IoT connected devices in the Indian market have grown from only 60 million in 2016 to an estimated 1.9 billion in 2020. This growth is expected to continue for both consumer and industrial IoT with multiple sectors adopting IoT.



Sectors in India that are adopting advanced technologies like Internet of Things (IoT)

Sector	Major trends	New opportunities
Utilities	<ul style="list-style-type: none"> • Convergence of Operations Technology (OT) and Information Technology (IT) to enable smart grid platforms, smart generation and capture from renewable energy assets • Smart homes are becoming a reality with smart metres, thermostats, automated lighting and switching, etc. 	<ul style="list-style-type: none"> • Connected home applications – smart appliances that control and monitor all home devices and also provide home security appliances that auto adjust according to temperature etc. • Smart entertainment – applications that control music between devices.
Manufacturing	<ul style="list-style-type: none"> • Manufacturers partnering with analytics and other technology companies to deploy IoT solutions for bidirectional information sharing, to derive more data from operations and streamline processes and activities especially in global or regional supply chains. • Players desire to offer product based services such as pay-per-use, outcome-based models, service-as-product models instead of a transactional one-time sale. 	<ul style="list-style-type: none"> • Smart manufacturing/factories - proactively monitor and send alerts for manufacturing output, quality parameters of products, energy usage, etc. • Connected products – analyse data gathered by using telemetry for remote monitoring. • Connected supply chain - monitor and plan route, based on real-time location and logistics requirements.
Agriculture	<ul style="list-style-type: none"> • Timely availability of better quality and quantity of food for consumers. • Farmers benefit from increased overall efficiency, crop productivity, benchmarking and high business performance. 	<ul style="list-style-type: none"> • Smart agriculture - gather real-time intelligence and advice, right up to the harvest stage; smart tractors and other equipment that encourage service-as-product instead of ownership model. • Livestock updates –Report cattle or herd nutrition, reproductive events, diseases, pasture quality and location with geo-fencing.
Transport and Logistics	<ul style="list-style-type: none"> • Becoming a service provider - logistics companies will look at monetising assets that are valuable to the consumer by providing them “as-a-service”. • Change in reliability on technology, organisational structure - the movement to a service oriented model will not only lead to technological changes, but also in the organisation’s channels, employees, etc. 	<ul style="list-style-type: none"> • Capacity Sensing -Detect/communicate open spaces in a warehouse, port, or parking lot. • Route optimisation -Map the shortest or most fuel-efficient route for delivery vehicles.
Automotive	<ul style="list-style-type: none"> • Achieve operational efficiency, enhance productivity and quality assurance through predictive maintenance, machine-to-machine connectivity, etc. • Introduction of new business models such as product-as-a-service, pay-according-to-use. 	<ul style="list-style-type: none"> • Partnership with technology companies for services such as Wi-Fi connectivity to infotainment options in cars, enhanced user experience across a wide range of consumer durables, remote vehicle management, auto insurance, mobility, analytics, and cloud management, etc.
Retail	<ul style="list-style-type: none"> • Rise of omni-channel retailing - integrated and seamless view of channels to drive digital innovation and dramatic acceleration of IoT in Retail. • Collaboration of retail and technology - retailers will be using several cloud and analytics applications to gain insights from the voluminous data of consumers. 	<ul style="list-style-type: none"> • Promotional sales - use beacons, proximity-marketing services that empower retailers by removing advertising clutter. • Location based advertising – connect with consumers to drive in-store traffic.

Broadband enables bridging of the digital access divide between large enterprises and MSMEs

MSMEs continue to play a key role in the Indian economy...

India has a large (~63 million) Micro, Small and Medium Industry base. A wide variety of products and services are being produced by the MSME sector and the Government of India is attempting to boost these enterprises through initiatives such as 'Make in India'.

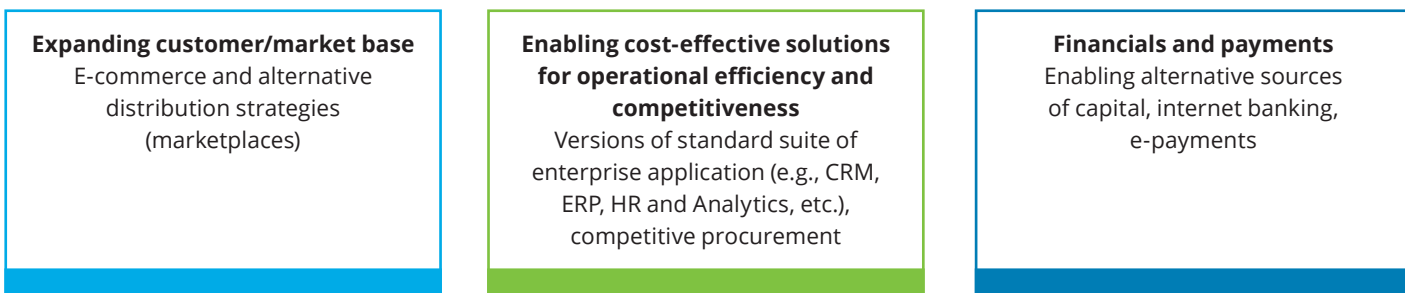
India is home to more than 630 lakh micro enterprises, 3 lakh small enterprises and over 5000 medium enterprises^[25].

Out of these, ~450 are listed on the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) and the listed MSMEs have a market capitalisation of nearly INR 20,000 crore.

MSMEs in India provide employment to approximately 11 crore people^[25].

As India moves towards higher connectivity and data consumption, adoption of digital market places and platform adoption along with greater ease of doing business and availability of tech infrastructure, there will be rise in broadband enabled usage of products and services.

MSMEs connected with a high-speed reliable broadband are seeking new markets and evolved products and services, similar to the large enterprises.



The emerging themes across the spectrum are triggering broadband-enabled usage of evolved products and services

A broadband platform-based ecosystem is developing to cater to these specific requirements of the MSMEs

MSMEs' requirements	Use cases
Expanded customer/ market base	<ul style="list-style-type: none"> Food delivery start-ups have enabled every food outlet to grow its customer base and scale up business. They are also establishing delivery kitchens, also known as cloud kitchens Multiple business listing platforms for MSMEs, with features such as lead management system, payment protection & facilitation services and services like BI/dashboarding with pay per Lead model are being employed
Cost effective solutions	<ul style="list-style-type: none"> Multiple ERP system providers offering accounting, taxation, payroll, etc., which are hosted on the cloud are being used by MSMEs New-age start-ups are offering easy to use and cost effective solutions for MSMEs across value chains such as customer service, sales management, marketing, communications management
Financial payments	<ul style="list-style-type: none"> Multiple start-ups that bring the benefits of online commerce to manufacturers, traders, suppliers, and wholesalers, especially in smaller towns UPI is developed by the national payment corporation regulated by the Reserve Bank of India and facilitates instant real-time payments Wallet applications that are enabling digital payments through QR codes, UPI IDs. and phone numbers

Source: Organization's data sources from respective official websites, names undisclosed

Impact of broadband on the economy

Broadband connectivity can unlock immense economic benefits. By empowering workers with information, internet access can kick-start economic growth and improve productivity, create jobs and lift hundreds of millions of people out of poverty.

Manifestation of the economic impact

The economic impact of broadband begins from the inception of infrastructure deployment and cascades down to multiplied benefits at every stage. The main impact results from the building of broadband networks which creates large number of jobs, directly and indirectly. The subsequent impact results from the advantages of organisations and customers being connected. The utilisation of broadband by enterprises leads to a multifaceted efficiency gain, which adds to an increase in GDP. On the other hand, utilisation by households drives an increase in the disposable family income. Beyond these immediate advantages, which contribute to the increment in GDP, households receive a benefit in terms of consumer surplus, determined by the difference between what the customer is ready to pay for broadband service and its cost.

This last parameter although not added to the GDP calculation, is important because it represents advantages gained in terms of better access to data, entertainment and public services.

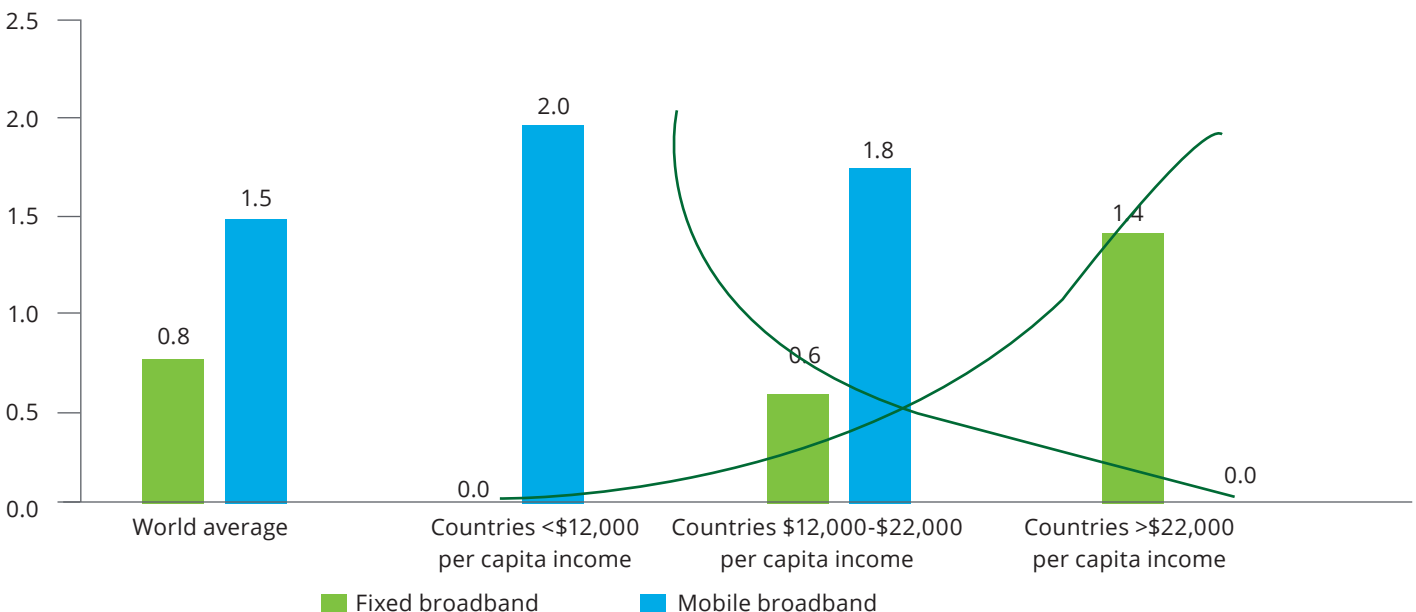
Expanding internet access can also lead to a more fundamental advancement in the structure of the Indian economy. A move from agriculture based to a knowledge based economy where information can be shared without barriers could be unlocked with access to the internet. Skills and knowledge would become a key rather than just access to resources. People and enterprises would have the ability to develop specialised expertise and new business models.

Macroeconomic impact analysis

At a macroeconomic level, an analysis conducted by ITU reviewed the impact of broadband, digital transformation and the interplay on ICT regulations on national economies.

As the model shows, globally an increase of 10 percent in fixed broadband penetration yields an increase of 0.8 percent in GDP, and an increase of 10 percent in mobile broadband penetration yields an increase of 1.5 percent in GDP [26].

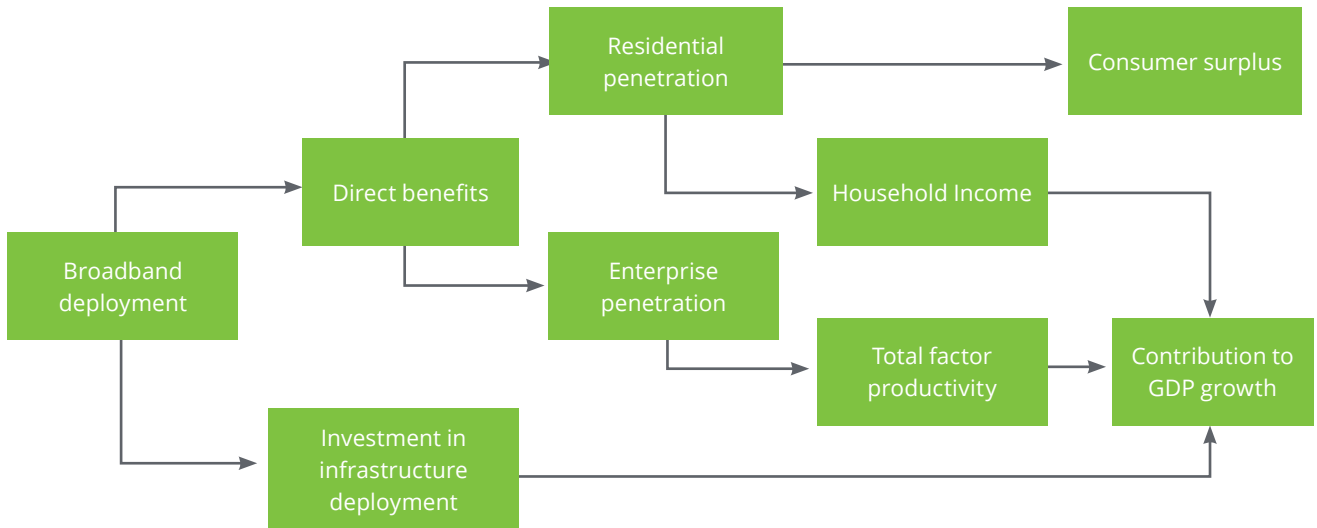
Economic impact of broadband worldwide



Note: Y-axis reflects percentage impact on a country's GDP. Value expresses as impact on GDP of 10 percent increase in broadband penetration

Source: ITU (Katz and Callorda) 2018

Cascading effects of broadband development on GDP



Source: ITU-BB-Reports_Impact-of-Broadband-on-the-Economy



Impact of broadband on job growth in India

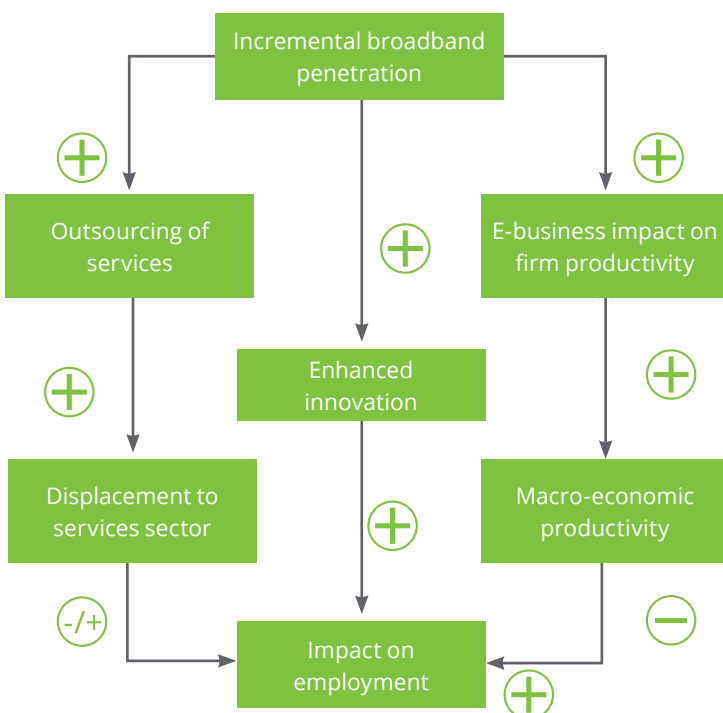
Broadband creates new jobs through several avenues: directly through the demand for labour from new technology-based enterprises; and indirectly through the demand from the wider ecosystem of companies that are created to support technology-based enterprises; for example network installation and maintenance providers and providers of other skill based services such as advertising and accounting. Importantly, the internet has the potential to create jobs that would not otherwise become available.

The increase in broadband penetration has branching network effects that impact job growth in three ways.

- Development of new technologies and applications expedite innovation.
- Enhanced productivity due to utilisation of advanced, complex and structured processes enabled by broadband
- Outsourcing employment with remote service delivery and information processing.

The enhanced productivity also leads to reduction in jobs as automation replaces human labour. However, this effect is neutralised by the additional jobs created in order to further advance technology and due to new business opportunities created by the application of these technologies. For instance, ML and AI implementation would replace traditional blue collar jobs but it would also open more up opportunities such as the creation of the AI based services. Outsourcing of jobs enabled by broadband also results in additional job creation

Network effects of broadband on employment



Source: Adapted from a model originally developed by MICUS in a report for the European Commission (see Fornefeld et al., 2008), mentioned in ITU-BB-Reports_Impact-of-Broadband-on-the-Economy

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Jobs created due to broadband network construction

- Employment generated in the short term in the course of deployment of network facilities for telecommunications technicians, construction workers, and civil and RF engineers
- Employment generated due to businesses buying and selling material and services to each other for e.g., metal products workers, electrical equipment workers, and professional services

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Government initiatives around Digital India to boost employment

- Over three lakh Common Service Centres (CSCs) providing government services in rural areas are hiring around 20 lakh digital cadets ^[27]
- It was announced in the National Conference on “BharatNet” – Launch of Phase 2 that implementation of Bharat Net project will generate around 10 crore man days of employment
- North East BPO Promotion scheme expected to generate about 12,000 jobs ^[28]

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IoT and AI applications

- A study by Broadband India Forum highlighted that IoT and AI apps are expected to generate more than 2.8 million jobs in rural India in the next 8-10 years (2.1 million in agriculture as a result of smart farms and 0.7 million in rural health care as a result of IoT based applications)

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Broadband access spurs jobs in hard-to-reach areas

- Expanding broadband access stimulates self-employment opportunities in areas with limited economic activity
- Rise in e-commerce spawned several e-logistics companies, opening up opportunities for drivers
- Industries are exploring innovative ways to partner with broadband service providers to gain access to rural workforce

Source: Secondary Research, Deloitte Analysis

Broadband connectivity enables the start-up ecosystem to thrive

Indigenous technology start-ups act as a major booster for the development and progress of the Indian economy while simultaneously delivering affordable and convenient services.

Broadband has been central for propelling the growth of number of successful start-ups in ed-tech, food delivery, e-commerce, etc.. Greater broadband penetration is leading to ecosystem expansion by development of new start-up hubs.

The Indian government has facilitated these growth opportunities by enabling the technology ecosystem for start-ups. Two key such initiatives are

- IndiaStack^[29] which provides a set of operating APIs based on Aadhar and UPI systems that start-ups can utilise to solve problems towards presence-less, paperless and cashless service delivery.

- Digital Saksharta Abhiyaan, which aims at improving digital literacy in rural areas and make people more knowledgeable about the various digital services provided by start-ups.

As a result, India has the 3rd largest startup ecosystem in the world and expected to witness a consistent YoY growth of 12-15 percent^[30].

India added 8,900 – 9,300 technology led start-ups in 2019, up from 7700-8200 a year ago^[30].

Start-ups in the country have been able to create an estimated 60,000 new jobs in 2019 , taking the total direct jobs in the start-up ecosystem to 1.6-1.7 lakh^[30].

Some of the examples of successful start-ups in India are given in the table below.

Overview	Indian cloud-based customer operations software company provides cross-functional team collaboration to deliver exceptional customer support	Indian SaaS company providing web based business tools including an online office suite, IoT management platform and suite of IT management software	Indian online education technology and online tutoring startup that develops personalized learning programs for K-12 students	Indian network centric B2B trade platform, designed specifically for MSMEs in India. It brings traders, wholesalers, retailers and manufacturers on to a single platform
Employees	2,700	8,375	9,000	7,000
Growth	Telephony, chat and support software saw 100 percent increase in first 6 months of 2020		7.5 million more users since March 2020	

Source: Organization’s data sources from respective official websites, names undisclosed

Key Challenges

Broadband penetration has grown at an impressive CAGR of 35 percent^[31] in India over the past three years (2017-2020). However, existing levels of broadband penetration in rural areas (29.1 percent penetration^[31]) and fixed broadband penetration (7.5 percent of Indian households^[32]) across the country offers significant opportunities for growth. Considering the transformative impact of broadband across business, economy, society it is critical for India to exploit and harness this growth opportunity.

Harnessing the full power of broadband is a multi-stage process:

1. **Availability:** The first step in this process is to ensure the availability of stable and high-speed broadband connectivity

2. **Accessibility:** The next step is accessibility to not only internet but affordable devices such as computers and mobile phones to access the internet

3. **Usability:** The final step in the process is usability. Citizens must possess the necessary digital skills and the applications/websites he/she intends to use must be available in the relevant vernacular languages.

Right of way issues, cost of infrastructure deployment, levels of digital literacy, access to affordable devices are some key challenges holding back the potential growth and mass adoption of broadband in India.



Developing the broadband ecosystem

Addressing challenges for developing a broadband ecosystem

The government, telecom players, regulator, and all key stakeholders in the value chain contribute to addressing the challenges in the current broadband ecosystem.

Government policy response

- **Government intervention through implementation of the BharatNet programme and National Broadband Mission:**

Recognising that the high cost of broadband deployment in rural areas cannot be borne by the private sector alone, the Government of India had established Bharat Broadband Network Limited, also known as BharatNet in 2012. The ambitious programme aims to connect 250,000 gram panchayats in the country with internet connectivity. To address hurdles relating to implementation and inefficient asset utilisation, the DoT made provisions for Public Private Partnership model, including the sale of fibre assets to private players, BOT models, and leasing. This will enable telecom players to access costly fibre assets in a variety of ways without having to invest significant upfront capital, time, and efforts.

The National Broadband Mission, sets a target of connecting each village with broadband, also setting targets in terms of fiberisation, speeds, and mapping of fibre to ensure efficient resource allocation.

Speed and definition – As identified by TRAI, significant improvements can be achieved in broadband speeds in the country. An important step is to pursue increasing the minimum broadband speed from 512 kbps to 2 mbps.

Government spending – Broadband is demonstrated to be a GDP multiplier and one of the most effective levers available. The National Broadband Mission envisages an expenditure of Rs. 30,000 crore for the project^[33]. The Government of India can consider an increase in the country's annual budget for financing universal broadband access and simultaneously increase efficiency in the utilization of the USOF. India can allocate a percentage of its GDP in the annual budget as an investment towards the development of this critical infrastructure.

- **Dig once policy** : The cost of digging and trenching to bury fibre cables underground is the largest cost element of the

broadband deployment process. The NDCP-2018 policy emphasises on promoting collaboration between state, local bodies, and private sector as necessary for provision of shared duct infrastructure in municipalities, rural areas and national highways. The programme envisages common ducts that would be provided by the land-owning agencies and leased to the service providers. This is aimed to solve Right of Way hassles, digging, restoration, and eliminate the need for re-digging roads and other lands. We must now focus on robust on-ground implementation of the policy

- **Research and development and broadband product development** - It is critical that Research and development, and significant amount of product development for broadband is done in India, to ensure the affordability of broadband. Preferential Market Access Clause in the Government broadband infrastructure programmes, along with 'Make in India' has provided a fillip to this.
- **Increase digital literacy**: One of the reasons for low broadband demand in rural areas has been low digital literacy. This further leads to lack of awareness around device usage, such as mobile phones and computers. Low digital literacy also leads to citizens being unaware of the capabilities and benefits of the internet. Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMG DISHA) is an encouraging initiative to promote and implement digital literacy
- **Access to device infrastructure** – Access to devices such as computers and mobiles is a large part of increasing broadband adoption. The government may explore innovative ways to achieve this (for e.g., a government backed initiative to source funds from villages at the gram panchayat level in order to set up computer labs may be one way to increase access to computers). This is critical because rural citizens with low incomes may not be able to afford computers and 3G/4G-enabled smartphones, instead preferring feature phones. Such labs can also be an enabler for imparting digital education at the gram panchayat level.
- **Continuous electricity supply** – Power supply/non-availability of grid power supply is a problem for both wireline and wireless internet access. Telcos have been grappling with the use of alternate sources of energy for towers in rural areas. Due to lack of power, running diesel generator sets increases the cost of operations of towers substantially, which creates problem in furthering both wireless and wireline internet ecosystems. Telecom

companies may partner with energy services companies to offer pay-to-own or leased solar home systems bundled with mobile connectivity and public wi-fi access points. Such initiatives can be made financially lucrative for rural citizens by offering the ability to sell excess electricity back to the grid, allowing an alternate income source.

Significant opportunities for telecom ecosystem

The evolving ecosystem provides significant opportunities for telecom operators along both the wireless and fixed broadband solutions:

- **Connectivity++ solutions for the MSMEs** – Businesses worldwide are recognising the importance of the largely untapped MSME market and building customised solutions. These solutions span from accounting, inventory management, sales and marketing platforms, payments platforms, credit, and other such areas across functions and value chains with connectivity at the core. This market presents an opportunity for telecom service providers to develop or partner with the product/ solution player and take the solution bundled with connectivity to the MSME.
- **Industry 4.0 and the IoT opportunity** – IoT enablement across sectors such as manufacturing, services, and agriculture provides a lucrative opportunity. The backbone of implementing Industry 4.0 on the ground is reliable, high speed broadband. There is significant opportunity for a B2B partnership between telcos and providers of IoT infrastructure to offer an integrated solution to private and public sector organisations.
- **Developing FWA:** As demand for home broadband increases, especially post the pandemic, telecom operators may consider higher investments in providing Fixed Wireless Access (FWA) in addition to or as an alternative to Fiber-to-the-x (FTTx). Capex for FWA is significantly lower than FTTx and can be offered at a lower price to the customer, thus increasing affordability for the customer and widening the potential customer base for the broadband service provider
- **Partnerships with health care and education providers** – Private and government hospitals and new-age technology start-ups are open to leveraging technology for better access and quality of health care. Digital technologies are revolutionary for rural areas that have traditionally witnessed poor access to health care and education. Telecom providers can partner with such players in the digital health care and education ecosystem to increase access and quality, while also lowering costs as a result of reduced need for expensive physical infrastructure, which has acted as the major roadblock in both areas.

Some examples of the partnerships include the following:

- The UK's National Health Service (NHS) collaboration with leading social media player for organ donation
- The NHS collaborated with a leading social media player to launch a campaign to directly allow donors to register for organ and blood donations. This addressed the long wait list in the UK for organ donations. This initiative is also being taken to Netherlands, the U.S., and Australia.
- Opportunity along similar lines exist for telecom providers to launch such a campaign in India through their apps, which are available with an access to a wider customer base.
- British Council – Telecommunications player's partnership in the Connecting Classrooms programme in Sudan
- The British Council partnered with a telecommunications player in Sudan to provide digital training and improve education quality by training more than 2000 teachers and school principals in more than 1000 schools. Other aspects of the programme included digitally administered conferences and workshops on quality education and child protection.
- **Connectivity++ solutions beyond entertainment for the homes** – The current ecosystem enables telcos to add value for their consumers through bundled product offerings beyond entertainment, such as catering to consumers' need in e-healthcare, e-education, home security in their broadband solutions, thereby improving the overall quality of life.

Some examples of the bundled solutions are:

- A. An Indonesian telecom player launched plans for students to study from home and access interactive and curated educational content. They also introduced plans bundled with smart home security cameras for monitoring,
- B. Singaporean telecom player bundled their plans with wellness programmes and personal and home insurance.

Conclusion

India has experienced a significant broadband growth in recent years, enabled by encouraging government policies and initiatives. However, rural India and fixed broadband across the country continue to present significant opportunities for growth. The need and demand for broadband has been further fuelled by the COVID-19 pandemic and its impact on the digital behavior of the countrymen and businesses. Considering the potential transformative impact of broadband growth on social, economic and business indicators of our knowledge-driven economy, it is critical that India does not leave any stone unturned to capitalise on this opportunity.

About Confederation of India Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, and the government and civil society, through advisory and consultative processes.

For 125 years, CII has been working on shaping India's development journey. This year, more than ever before, it will continue to proactively transform the Indian industry's engagement in national development.

CII is a non-government, not-for-profit, industry-led, and industry-managed organisation, with about 9,100 members from the private and public sectors, including MSMEs and MNCs, and an indirect membership of more than 300,000 enterprises from 288 national and regional sectoral industry bodies.

CII charts change by working closely with the government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness, and business opportunities for the industry through a range of specialised services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists the industry to identify and execute corporate citizenship

programmes. Partnerships with civil society organisations carry forward corporate initiatives for integrated and inclusive development across diverse domains, including affirmative action, livelihoods, diversity management, skill development, empowerment of women, and sustainable development.

With the theme for 2020-21 as Building India for a New World: Lives, Livelihood, Growth, CII will work with government and the industry to bring back growth to the economy and mitigate the enormous human cost of the pandemic by protecting jobs and livelihood.

With 68 offices, including 10 centres of excellence in India and 9 overseas offices in Australia, China, Egypt, Germany, Indonesia, Singapore, the UAE, the UK, and the US, as well as institutional partnerships with 394 counterpart organisations in 133 countries, CII serves as a reference point for the Indian industry and the international business community.

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