Leveraging the digital connect: North Eastern India

September 2016

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Forewords

FICCI

It is my privilege to present the 3rd Connect North East, a product and a brand created to promote economic and socially inclusive strategies for the North East India. We are pleased to report that the North East has slowly but surely featured in an aggressive agenda by successive governments both in Delhi and the states focusing on People to People, Government to Government and Business to Business. No doubt the emphasis on connectivity by road, river, rail, air has been well received but implementation has been slow and challenging. I believe energy is another area where there is an inherent scope for the region to cooperate with neighbouring countries like Bangladesh and Bhutan etc. North East India with 8% of India's land and 42 million people is the countries gateway from and to the ASEAN and South East Asia.

The 1st and 2nd Connect North East held in Guwahati and Shillong explored the potential to build upon and expand traditional trade linkages with neighbouring countries, to create new and upgrade existing infrastructure in roads, railways, airways, and waterways and the scope for a North East economic corridor amongst others. The framework of suggestions resulting from these summits highlighted the scope for developing the North East as a frontier for economic and strategic collaboration with the countries like Bangladesh, Bhutan, Myanmar and other BBIN and ASEAN nations. The FICCI KPMG report 'Emerging North East India' which was released at the 2015 North East Connectivity Summit at Shillong identified key action points and an agenda for the way forward.

Among the parameters that define connectivity in a modern economy, digital connectivity has become synonymous with a complete transformation in the way the world conducts its business. It has brought a paradigm shift in business, education and governance processes. Today, a strong digital backbone is an essential ingredient necessary to harness and strengthen development in all other sectors. This report delves into how a digital connectivity based model can reengineer the way the economy and governance functions in North East. The report explores how with its unique geography and location, the North East can leverage digital connectivity to catalyse economic growth and investments in the region especially through transformation in Agriculture, ICT, Textile, Sports, Tourism, Healthcare, Education etc.

The setting up of the Internet Gateway in Agartala, with connectivity through Coxes Bazar in Bangladesh, has opened up a whole new vista of opportunities for North East India. The project has the potential to provide the much needed impetus to the region's connectivity besides laying the foundation stone for its transformation into a digital economy.

The 3rd Connect North East Summit at Agartala will provide a platform for convergence of ideas and hopefully give impetus to a new model of collaborative development with participation of Government, the private sector and civil society from India and the Neighbouring Countries. This initiative will continue next year at Kohima, Nagaland with the 4th Connect North East during September, 2017

I must thank KPMG for the effort that they have put in in preparing this report. I must also thank the other agencies and individuals who have shared their insights and facilitated preparation of this report.

I am with renewed vigour and hope that our efforts in an initiative like North East Connectivity is in the right direction and this year's summit shall expand our understanding of the key drivers for progress of the North East Region.

Ranjit Barthakur

Chairman
FICCI North East Advisory Council

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KPMG

For the third North-East connectivity summit being held in Agartala in September 2016, KPMG in India and FICCI have collaborated to produce this publication titled 'Leveraging the digital connect: North Eastern India'. With a focus on digital connectivity, this publication is inspired by the positive developments that have taken place across the region including the inauguration of the International Internet Gateway, extending from Tripura to Bangladesh[1].

This report provides an in-depth analysis of the current digital scenario and proposes a major overhaul of the region's connectivity infrastructure. We have identified several subsectors including education, healthcare and tourism which could benefit from an improved digital environment. Key opportunities for investment have been proposed including technical and commercial opportunities in industries such as textiles and food processing. Further, the publication presents the North-East Region as a gateway of trade and commerce to Bangladesh and ASEAN economies.

For the second North-East connectivity summit held in Shillong in 2015, KPMG in India and FICCI jointly prepared a report titled 'Emerging North-East India: economically and socially inclusive development strategies'. This report highlighted the key prospects of the region and provided recommendations and policy initiatives to help trigger growth and development. We highlighted the importance of connectivity within the North-East Region as well connectivity with its neighbouring countries.

The North-East Region has a difficult challenge ahead but must strive to strengthen its business case for investment in digital infrastructure and other key sectors, boosting the local digital ecosystem. The North Eastern States should create a single digital market, improving cross-border regulations with Bangladesh and ASEAN economies to facilitate trade and expand digital and broadband connections.

Collaborating together, the private sector and government must contribute to this growth. An amalgamation of investments in education, healthcare, entertainment and information and communication technology (ICT) infrastructure by enthusiastic public and private players has huge potential to build a digital North-East India and close the supply-demand gap.

Through this report, we aim to provide an analysis of the region for the use of investors and policy-makers whilst proposing key opportunities that can be leveraged through ICT and digital technologies to promote social and economic development.

Pradip Bhowmick

Partner
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1. The Times of India, 2015. 'Agartala to be India's 3rd int'l internet gateway'. Available online at: <http://timesofindia.indiatimes.com/city/guwahati/Agartala-to-be-Indias-3rd-intl-internet-gateway/articleshow/47940672.cms> [Accessed: July 2016]

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Table of contents

Introduction 01

Overview of digital connectivity 07

Digital development model 13

Business development: leveraging digital 29

Connectivity with neighbouring countries 47

Roadmap for development 51

Appendix 53

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Introduction

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Context

The landlocked seven-sister states are characterised by their unique geopolitical location but have vast potential for economic growth. One of the key economic impediments faced by the North East Region (NER) is the lack of connectivity, largely on account of underdeveloped infrastructure. The lack of substructures including transportation, ICT and communications and market accessibility limit connectivity and therefore the region has been unable to develop in line with the rest of India or improve connectivity with neighbouring countries.

The Indian government has strived to help these states utilise their potential: the 'Look East Policy' enacted in the early 1990's is now accorded high priority and turned to 'Act East Policy' . In the course of imaging this region in a strategic sense, the 'North East Region Vision 2020' was unveiled in July 2008 with the aim of accelerating development to achieve sustainable progress and prosperity. While efforts are underway, there is still a long way to go.

Third internet gateway

Signaling the escalating development of the North Eastern states, Agartala has been inaugurated as India's third international internet gateway link, after Mumbai and Chennai, through Bangladesh extending to the rest of the South East Asian Countries . A 100MW power supply will extend from Tripura to Bangladesh alongside the export of 10GBPS Internet Connectivity to India. Besides the boost in the bilateral relationship between the countries, this easing of bandwidth is set to give the people of Tripura consistent net connectivity and also increase the internet speed across the North-East Region.

Owing to the ample room for development in the NER, after addressing the various gaps in infrastructure and acceptability among the locals, the improvement in the internet and telecommunication services is likely to have a direct impact on the economic upsurge in the area. The basic ICT and network coverage can aid seamless inter and intra trade and deliveries in the North Eastern Region. The enablement and integration of the digital corridor in the NER can help facilitate and nurture the business environment, by providing diverse growth opportunities to the industries and attracting investment.

2. The Economic Times, 2014. ''Look East' policy now turned into 'Act East' policy: Narendra Modi'. Available online at: <http://economictimes.indiatimes.com/articleshow/45136929.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst> [Accessed: July 2016]
3. The North East Today, 2016. 'Tripura: Agartala becomes India's Third Internet Gateway'. [Accessed: June 2016]

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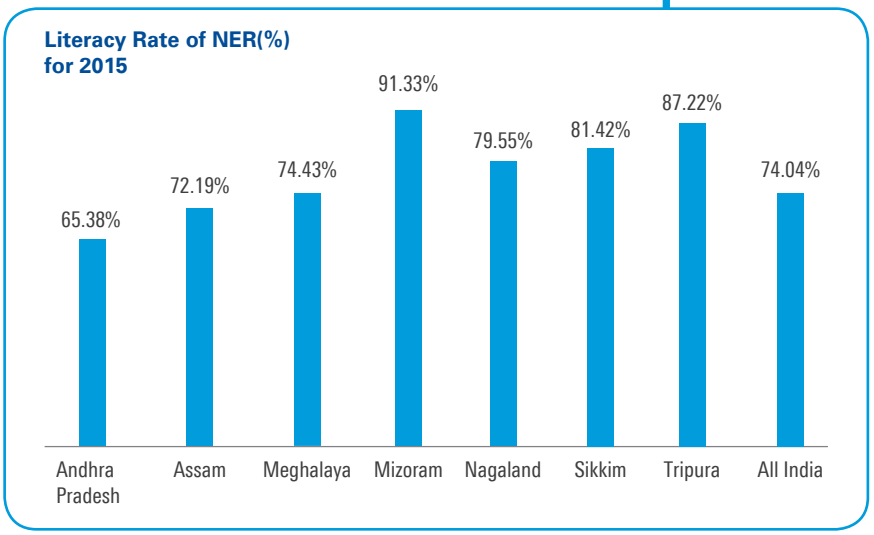
Driving forces of emerging North Eastern India

Strategic location- The geographical location of the NER is of immense strategic importance on account of the fact that they border multiple countries. Industrialisation of this region can therefore help boost trade relations with the neighbouring ASEAN Countries.

Natural resources- The NER is richly endowed with vast naturzal resources. One of the most bio-diverse regions of the world, there is vast potential for increased export of tea, bamboo, jute and silk as well as horticulture and herbal resources.

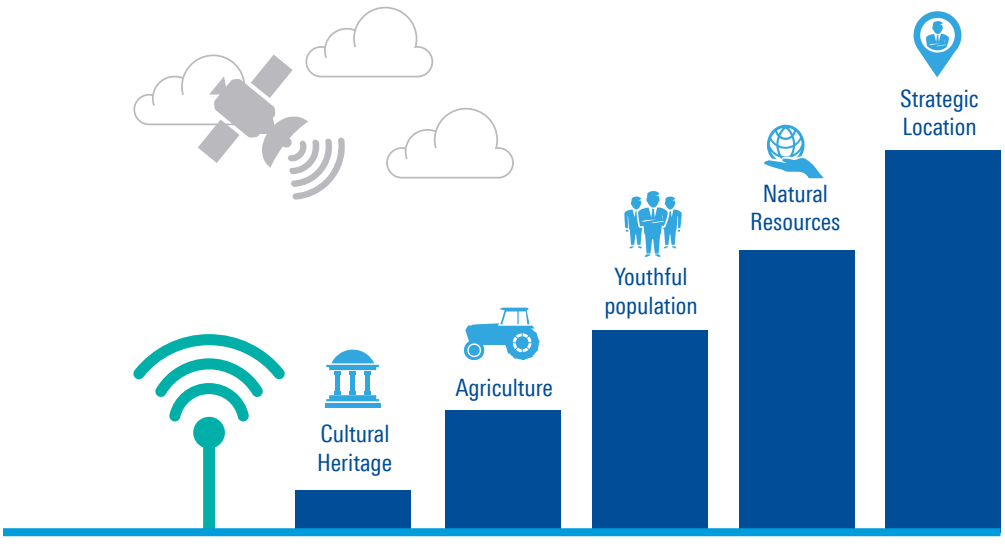
Youthful population- The youthful workforce could be harnessed for its potential as a national asset. The level of education is alleged to be higher than the rest of India. Almost all the North Eastern states cross the 60 per cent mark of the education index.



Source: Basic Statistics of North Eastern Region 2015, Government of India, North Eastern Council Secretariat. [Available at: <http://necouncil.gov.in/writereaddata/mainlinkFile/BasicStatistic2015.pdf [Accessed: June 2016]

Agriculture- Agriculture is the most flourishing industry in the NER. The land in these regions are extremely fertile and therefore the utilization of this asset should be optimized for superior produce.

The NER is a reservoir of natural resources and has the potential to become the centre of the economic unit of India by augmenting trade relations with neighbouring South East Asian Countries



With these advantages as well as the provision of monetary resources and enabling policies, the region can begin to contribute to the economic resurgence and India's current wave of globalisation.

Source Adapted from: Goswami, N. 2010. 'India's North East 2020: Four Alternative Futures. Available online at: <http://www.idsa.in/system/files/OP_IndiasNortheast2020.pdf> [Accessed: July 2016]

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Spillover effects

While strengthening connectivity and improving the infrastructure within the North-East Region there are several subsectors which can also benefit from the spill-over effect. These include tourism, education, trade and business, infrastructure, energy and agriculture. The development of the region can therefore act as a catalyst in harnessing its true potential.

Development of the infrastructure and connectivity within the entire North East Region through roads, highways, railways, better air and water transport connectivity, planned cities will act as an enabler in aiding a number of sectors to flourish and achieve their full potential.

Various sectors that could benefit from the progression of the NER of India

Sub-Sectors	Prospective benefits
Education	• Improved course materials and focus on ICT Training • Diversified pool of talented learners by attracting students from neighbouring countries • Vocational Education, Skill Development Courses and Training Institutions • Tele-education and Knowledge Sharing Processes
Tourism	• Improved wayside and destination amenities such as public restrooms, drinking water joints, restaurants, organised recreation facilities. Other facilities include money exchange, souvenir shops and adequate accommodation • Promoting the entire NER as a brand for attracting national and international travel. Reducing the interstate competition and focus on branding as a single unit • Various online platforms can be used for marketing and advertising strategies such as off-season discounts, targeting niche markets specific to cultural circuits such as nature and adventure, culture and religion • Encouraging 'Wellness Tourism' as the NER possesses scenic locations ideal for spa resorts, yoga and meditation treats, health and fitness centers, etc.
Environment	• Preserving and sustaining the diverse ecosystem • Disaster Preparedness and Management • Applying management strategies for the biodiversity resources of the region • Solar installments and weather insurance mechanisms alongside strategic knowledge of the climate change action plans.
Healthcare	• Improved connectivity will reduce distance barriers and provide medical support to patients in remote locations • Advanced Medical Support with superior equipment, improved clinical services and efficient treatment techniques • Cleaner and well managed hospital environment in order to increase patient care and satisfaction • ICT enabled Tele-Medicine. Better management of hospital supply and patient records.
Smart Cities	• With the development of infrastructure in the city, ICT-enabled services and projects can be implemented • Improved connectivity will help enable urban mobility in the region • Improvement in the citizen services such as public information, people engagement tasks, video monitoring for reduced crime rates, etc. • Smart Schools with ICT-enabled classrooms and online lectures.

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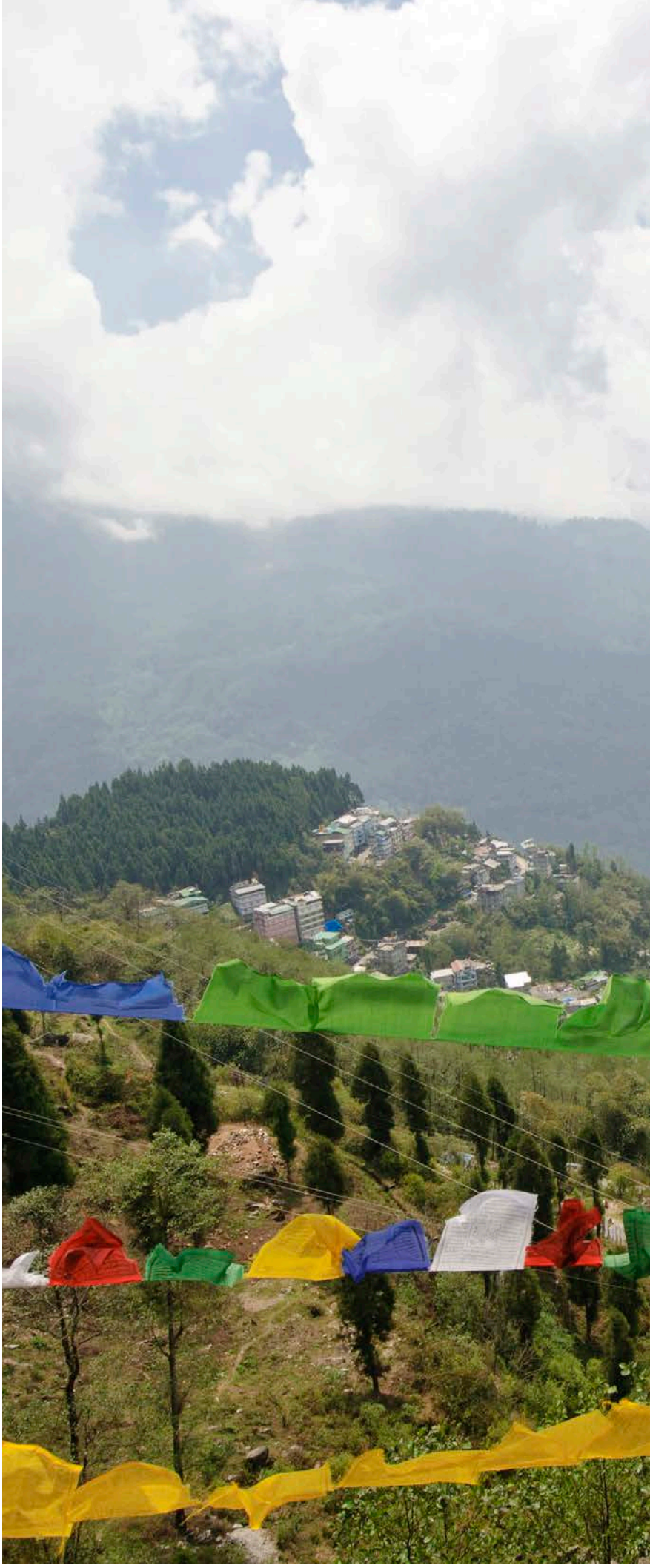
Reserve provision for development of North Eastern India

Large amounts of monetary resources are being earmarked for funding developmental projects in the NER. The present government has allotted a total of INR53,706 (USD8.9 billion) for the FY 2014-2015 for the advancement of the largely underdeveloped regions of North-East India[4]. Most of the central government ministries are compulsorily required to earmark 10 per cent of their budget for expenditure in the NER. The Deputy Governor of the Reserve Bank of India has revealed that funds allocated to the North Eastern Region are higher than the total amount of funds India receives from both the World Bank and Asian Development Bank combined[5] .



4. Quartz India, 2014. 'The budget lavished funds on India's northeast, where money can only do so much'. Available online at: < http://qz.com/234154/this-budget-lavished-funds-on-indias-north-eastern-states-but-money-doesnt-solve-all-bottlenecks/> [Accessed: July 2016]
5. Quartz India, 2014. 'The budget lavished funds on India's northeast, where money can only do so much'. Available online at: < http://qz.com/234154/this-budget-lavished-funds-on-indias-north-eastern-states-but-money-doesnt-solve-all-bottlenecks/> [Accessed: July 2016]

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Overview of digital connectivity

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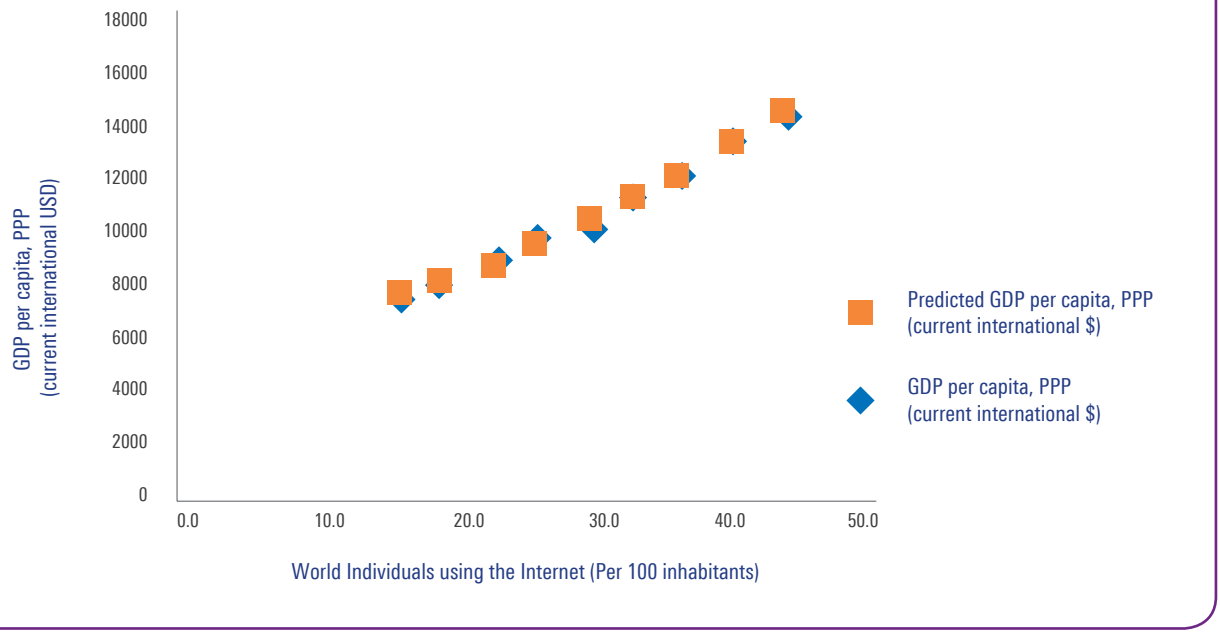
Digital infrastructure is fundamental in supporting trade and community through information exchange and connecting people to people. It supports the delivery of services and reduces the cost of doing business, increases consumption and enhances operational efficiency. Thus it drives up the GDP of the economy.

According to KPMG in India's analysis, an increase of internet consumption can strongly correlate with an increase in GDP of the economy which in turn signifies an increase in industrial output and overall employment.

KPMG in India performed a simple linear regression analysis of the world's internet consumption data versus the world GDP per capita and found that approximately 98 per cent of the variation in the world GDP can be explained by the amount of internet consumption in the world economy. Thus with a 10 per cent increase in internet penetration there is an approximate increase of 4.4 per cent of GDP per capita[6].



Digital infrastructure is broadly defined as submarine and satellite communication networks, tower infrastructure, wired and wireless communication networks as well as applications supporting the development of these communication networks.

Bridging the digital divide and overcoming the issues would require significant commitment from the NER member states to improve the competitiveness of their regional ICT sectors.

6. KPMG in India's analysis. August 2016

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In this paper we have gauged Digital Connectivity in the North-East based on four parameters: **Supply, Demand, Experience and Potential.**

Supply

Supply means investing in strong digital infrastructure that can provide digital services to those who want them. This in turn boosts demand that drives up the investment in supply.

In the NER, the only optic fibre link that travels nearly 2,000 km through the ecologically sensitive zone to connect the NER to Chennai landing station via Kolkata and Assam, remains inoperative for half of the year[7]. The broadband connectivity is intermittent and at a slower speed (less than 256Kbps) and most of the connection is fixed or wired. Most of the e-services given to the people in the NER are via government initiatives. BSNL is the incumbent public telecom player providing rural connectivity. There is a paucity of private initiatives in terms of investments in connectivity in the NER.

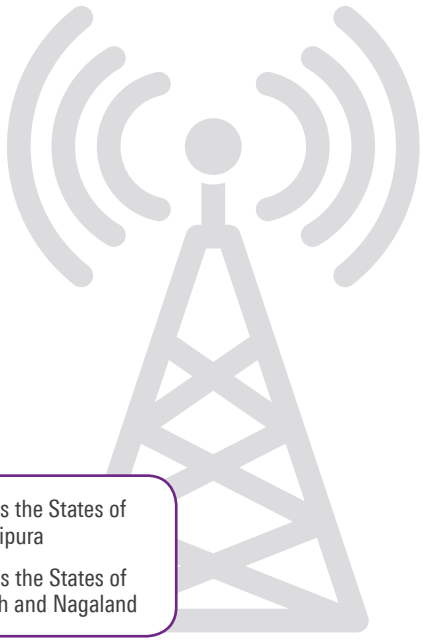
A snapshot of digital infrastructure scenario in the NER has been tabulated below as of 2011:-

Circle-wise Number of Cellular Connections and Cellular Base Transmitting Stations (BTS) 2G and 3G Provided by BSNL		
Name of Circle	No of Cellular BTSs (2G)	No of Cellular BTSs (3G)
North East-I	602	180
North East-II	609	183
Assam	1353	629
Total	73683	23432

Source: IndiaStat, 2011. 'Socio-Economic Statistical Information about India'. Available online at: < http://www.indiastat.com/telecommunication/28/network/19279/networkofbsnlmtnl19482016/449522/stats.aspx> [Accessed: June 2016]

Circle-wise Number of Broadband Connection Provided under Universal Service Obligation Funds (USOFs) Rural	
Telecom Circle	No. of Broadband Connections Provided
Assam	5067
North East I	2374
North East II	7872
India	656345

Source: IndiaStat, 2011. 'Socio-Economic Statistical Information about India'. Available online at: < http://www.indiastat.com/telecommunication/28/network/19279/networkofbsnlmtnl19482016/449522/stats.aspx> [Accessed: June 2016]



NE-I Telecom Circle includes the States of Meghalaya, Mizoram and Tripura

NE-II Telecom Circle includes the States of Manipur, Arunachal Pradesh and Nagaland

7. The Hindu Business Line, 2016. 'Net connectivity for North East set to gather speed'. Available online at: < http://www.thehindubusinessline.com/info-tech/net-connectivity-for-northeast-set-to-gather-speed/article8348990.ece> [Accessed: June 2016]

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Demand

Demand measures people's desire for connectivity. ICT infrastructure and how it is used are the main demand stimulators of connectivity. Connections to the Internet via PC, mobile devices can measure the demand side of the connectivity. According to the 2011 census, below is a snapshot of demand side connectivity for the NER region:-

States	Households	Computers	%	With Internet	%	Without Internet	%
Sikkim	128131	14735	11.5	4228	3.3	10507	8.2
Arunachal Pradesh	261614	21452	8.2	5232	2	16220	6.2
Nagaland	399965	35597	8.9	6799	1.7	28797	7.2
Manipur	507152	45644	9	10650	2.1	34993	6.9
Mizoram	221077	33604	15.2	5527	2.5	28077	12.7
Tripura	842781	60680	7.2	8428	1	53095	6.3
Meghalaya	538299	40911	7.6	8074	1.5	32836	6.1
Assam	6367295	592158	9.3	101877	1.6	490282	7.7
India	246692667	23189111	9.4	7647473	3.1	15541638	6.3

Source: India 2011 census data; state-wise internet users

According to 2011 census figures, the average number of households with internet, i.e. 1.9 per cent in NER is below the overall India average of 3.1 per cent while Assam with the highest number of people living in North-East (68 per cent of the population of NE), has one of the lowest percentages in terms of households with internet.

States	Households	Phone Users	%	Landline	%	Mobile	%	Both	%
Sikkim	128131	93536	73	2306	1.8	86745	67.7	4485	3.5
Arunachal Pradesh	261614	126360	48.3	7587	2.9	104122	39.8	14650	5.6
Nagaland	399965	212381	53.1	5200	1.3	194383	48.6	12799	3.2
Manipur	507152	291612	57.5	15215	3	265240	52.3	11157	2.2
Mizoram	221077	160944	72.8	3758	1.7	141268	63.9	15918	7.2
Tripura	842781	405378	48.1	17698	2.1	359867	42.7	27812	3.3
Meghalaya	538299	231469	43	8074	1.5	210475	39.1	12919	2.4
Assam	6367295	3049934	47.9	140080	2.2	2763406	43.4	146448	2.3
India	246692667	155909766	63.2	9867707	4	131240499	53.2	14801560	6

Source: India 2011 census data; state-wise internet users

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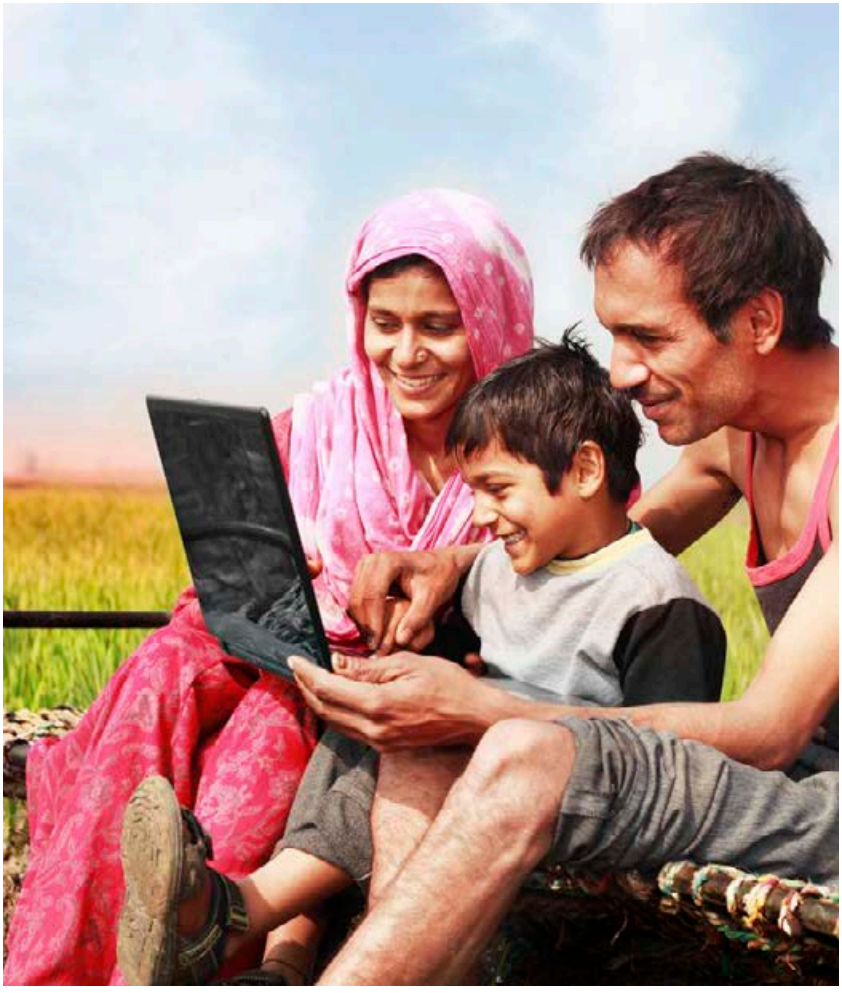
According to the above **2011 census** figures, percentage share of households having a telephone (Mobile Only) is highest in Sikkim and Mizoram (above 60.1) while other states fall below the India average.

Month-wise Number of Telephone Wireless Subscribers in NE							
Month End	Bharti	Reliance	Vodafone	Idea	Aircel	BSNL	Total
January	3844096	336438	1500392	492579	3112530	1476160	10762195
February	3876134	363365	1525366	501369	3109130	1509729	10885093
March	3903133	375245	1531194	503791	3133041	1537268	10983672

Source: Indiastat.com

While BSNL is the dominant player in the NER, there is an intermittent presence of other telecom players within North Eastern India. Though the number of mobile wireless subscribers has been growing, the growth rate is not significant which indicates that a faster pace of investment may be required in terms of tower infrastructure. Also a collaborative effort is required to formulate policies regarding Right of Way (ROW) permissions, site clearances and subsidy grants.



Potential

North Eastern states have thriving food processing, cement, fertilizer and pesticide production, handicrafts and iron and steel, jute, khadi and village industries, MSME, oil and Vanaspati, rubber, textile, tea and sugar industries. However, the ICT sector is almost absent due to lack of skilled ICT talent, ICT infrastructure and the ICT industry to absorb the talent. However there are CSCs which help in delivering e-government public services to the people in the North-East. With greater private and public investments in the telecom, education and IT sector, North Eastern states especially Assam, Sikkim, Tripura, Nagaland and Manipur have the potential to get converted into IT hubs.

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Experience

Experience analyses the connectivity experience that end users and organizations receive. Some of the factors which help in analyzing the experience are affordability, response speeds, network availability and customer services. The below table highlights some of these factors for the telecom operators present in NER

Performance of Quality of Service(QoS) Parameters for Cellular Mobile 2G services in the North-East			
Service Operators	Network Availability		POI
	BTSs Accumulated downtime (not available for service) <=2%	Worst affected BTSs due to downtime <=2%	Point of Interconnection (POI) Congestion (Number of POIs not meeting the benchmark) (Averaged over a period of quarter) <=0.5%
Aircel	8.52	48.8	0
Airtel	0.66	1.41	0
BSNL	2.75	8.63	0
Idea	1.57	1.63	0
RTL	0.46	1.42	0
Vodafone	1.48	1.92	0

Performance of QoS Parameters for Cellular Mobile 3G Service in the North-East			
Service Operators	Network Availability		POI
	BTSs Accumulated downtime (not available for service) <=2%	Worst affected BTSs due to downtime <=2%	Point of Interconnection (POI) Congestion (Number of POIs not meeting the benchmark) (Averaged over a period of quarter) <=0.5%
Aircel	9.94	48.19	0
Airtel	1.04	1.2	0
BSNL	2.11	10.68	0
RTL	1.05	10.02	0

Source: TRAI, 2015. Performance Indicator Report 2015. Available online at: <

From the above table we can conclude that both BSNL and Aircel within the NER, perform below the India benchmark in terms of network availability.

Thus in order to fulfill the digital NER vision, we need to make an incremental change in the four above mentioned pillars. Progress in the supply pillar is likely to drive demand which can improve the experience of services on account of increased competition and thus generate significant potential which could in turn lead to further investments in the supply.

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Digital development model

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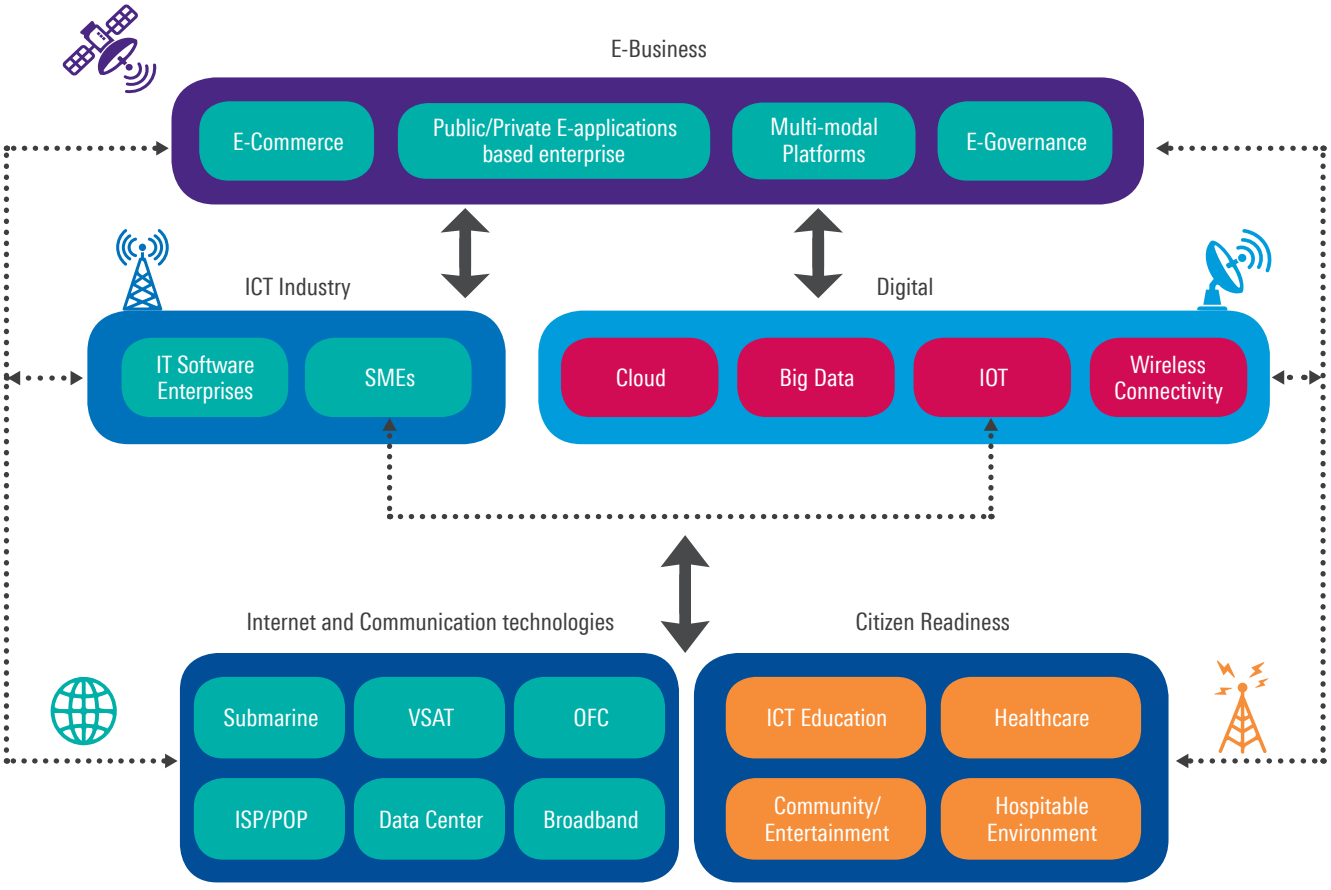
Keeping the four pillars in mind, we have designed a four-layered structure of achieving the Digital NER vision. This is distinct from a pure internet vision in the sense that the digital economy encompasses the share of GDP contributed by the ICT sector. Thus the premise of the model is that the internet, the use of IP standards of communications throughout the economy- from mobile networks to private networks used by banks, payment system companies, airlines and corporations to government and public service networks- create the structural foundations of the digital economy.

Layered model of the internet infrastructure

In the first layer we have the basic internet infrastructure and the citizen community. The basic internet infrastructure talks about the development of various ICT components ranging from the availability of international bandwidth to availability of mobile networks. Along with this, we have the citizen readiness which looks at the availability of ICT education in the North-East as well as the healthcare facilities and entertainment options to provide livelihood support to the young pool of talent in the IT/ ICT hub. The second layer mainly consists of the IT/ICT industry layer encompassing the development of high tech zones and software technology parks in the North East, thereby absorbing the talent base produced by the university education in the Region. The third digital layer is the extension of the basic ICT layer. This includes the improvement of the basic ICT layer in terms of better technologies of broadband, wireless networks in terms of Wi-Fi and cloud technologies to provide hardware and software as service and technology to support the Internet of Things. Finally the e-business layer which rests on the underlying three layers and encompasses delivery of services and products using resources from the other three layers.

In each of these layers, we have discussed where the technical and commercial opportunities lie. Consequently we have explored the various private and public schemes providing assistance to build each layer. Post the gap analysis, we have recommended few policies which can help bride the digital divide gap in the North Eastern states of India.



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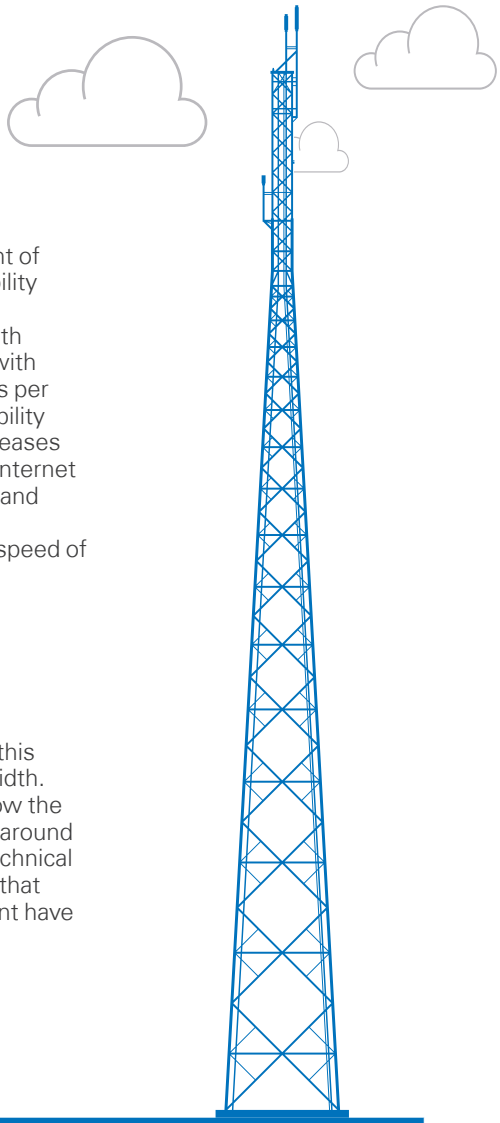

ICT technology

For a while now, the internet has been transforming communication across sectors, nations through various social activities and economic platforms. This means the parameters to gauge internet access and connectivity have also changed to aptly measure its scale and scope. Ultimately this indicates IP-based networks form the underlying premise of emerging digital economies and not just internet-based companies. This is particularly pertinent for the North Eastern states of India with their relatively lower per capita income.

The most important component of this internet layer is the availability of international bandwidth. International capacity bandwidth per capita correlates strongly with the proportion of internet users per country. Additionally the availability of international bandwidth increases internet penetration, reduces internet transit pricing, reduces broadband subscription rates for internet consumers and increases the speed of broadband access.

Availability of international bandwidth

In addition to the internet link passing through North Bengal, North Eastern India recently received an alternative source of internet. With the recent Indo-Bangladesh border agreement, Bangladesh Company Limited (BSCL) will lease 10GBps Bandwidth to India. The work will be undertaken by BSNL[8] . Not only North-East but other parts of India may also benefit from this additional availability of bandwidth. However much depends on how the entire ICT infrastructure is laid around this internet link. Few of the technical and commercial opportunities that may arise due to this agreement have been highlighted below.

Technical Opportunities

Service Operators	Network Availability
Satellite-based communication	While submarine cables provide a mean to access international bandwidth, satellite communications can used as a reserve to back up the submarine cables or backhaul equipment where submarine cable or laying fibre cable is not possible. India saw a 2.92 per cent growth in VSAT subscriber base in March 2016 from December 2015[9]
Cable up-gradation	The NER states can avail options ranging from up gradation of existing copper cables to optic fibers becoming available in order to complement latest internet infrastructure technology
Bandwidth up-gradation	There are opportunities in the future to upgrade bandwidth to the new submarine cable i.e. SEA- ME- WE-4 through Bangladesh from existing 10GBps to 40 GBPs
Opportunities with other ASEAN economies	In order to relax the capacity constraint, the government of India can look forward to entering into an agreement with other Asian economies in order to connect the North Eastern states of India to different ASEAN submarine cable express systems thus providing new and upgraded access to international broadband

8. Telecomtalk, 2015. 'Broadband Boost for North East Comes with 10Gbps Bandwidth from'. Available online at: <Bangladeshzhttp://telecomtalk.info/broadband-boost-for-north-east-10gbps-bandwidth-bangladesh/134629/>[Accessed: July 2016]
9. Trai, Performance Indicator 2016

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Commercial Opportunities

Besides technical opportunities, there are multiple commercial opportunities present with various telecom players and ISPs to invest in order to improve the internet backbone of the region. Some of them have been highlighted below:-

Name	Description	Company
VSATs	The landlocked North-East region of India can be served internet bandwidth through VSATs. Both private and public players should be mopped up to invest in satellite network in the North-East- At approximately, 38000 GPs in North-East states of India and not all under Bharat Net National Optical Fibre Network (NOFN) Phase-1 project of Government of India (GOI)[10], we have almost 4000 GPs that need to be covered by internet connectivity. With GOI's scheme of CSC 2.0, according to which every GP should have an internet enabled CSC for last mile connectivity, the investment potential stands at an approximate value of 216 crore for a single year VSAT installation. Additionally under Bharat Net's NOFN project, GP whose distance from Block HQ is over 10 km, satellite media would be used to provide broadband[11].	More and more telecom players can be invited to provide internet services through VSAT in potential B and C grade towns with no internet infrastructure and last mile network problem. They can be also invited to become potential partners for NOFN projects.
Local content hosting	Encourage local content hosting in order to reduce internet transit costs and maintain high quality of service delivery. This can lead to users creating more content, which will further help to attract new users in a virtuous cycle of growth. To encourage this, it is essential to have well-functioning internet exchange points (IXPs) through which ISPs can access locally-stored data. Local data centres must address and understand the needs of the local content market.	Content providers and content developers (both local and international) who can invest in content creation, hosting and distribution. Additionally, there is dire need of investment in developing technical knowledge and skills.
Local caching facility	Encourage local caching facility (connect state data centers by broadband to international gateways). This results in a greater volume of local internet traffic	Though the market is dominated by few players, with NOFN and Digital India initiative, more and more players are likely to enter this industry, making the industry much more competitive

Government Schemes

Both NOFN and Digital India initiatives have huge potential for substantial addition of internet subscribers at the North Eastern states in India. However there is room for improvement in addition to the opportunities. A few recommendations to help facilitate them include:

- To close the technical and skill gap requirement, both the government and private players can come forward to invest in necessary resource creation for the implementation of Digital India initiative
- In addition to this, GOI can provide a waiver of satellite bandwidth charges for viability of service in North Eastern states to private players but the subsidy determination should be a market determined competitive process
- State governments should come forward to assist in road expansion works in order to prevent damage to the optical fiber network.
- The government should ensure a non-discriminatory use of its network infrastructure which can be accessed by every service provider
- Fast paced initiatives in terms of partnerships with neighbouring countries can be established on a mutual basis to improve digital connectivity in the North-East.

10. Report of the Committee on National Optical Fibre Network (NOFN). Published: 31st March, 2015
11. Digital India, 2011. 'CSC 2.0 Scheme'. Available online at: <https://www.csc.gov.in/index.php?option=com_content&view=article&id=174&Itemid=331>[Accessed: June 2016]

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Back-haul architecture- In-Land connectivity

In order to reach to the most remote corners, a strong back- haul architecture is needed for internet links. High speeds cannot be reached if backhaul link is inefficient. A backhaul link can be provided through wireless (3G/4G, cell sites) through microwave or wired connectivity via copper co-axial cables or optical fibre cables. While most of the backhaul is provided through the copper networks of BSNL from rural areas, microwave-based wireless network are completely absent. Thus,there is an inevitable need to develop back-haul on optical fibre. Parameters used to gauge the longevity and performance of this back-haul architecture are high bandwidth, reliability, robust, sustainability and scalability.

Technical Opportunities

Name	Description
Last Mile Connectivity	Identification of state/district headquarters and GPs through GIS mapping to be connected by optical fiber
Connecting North-East wirelessly	In rural areas of North Eastern India, wireless connectivity via microwave is almost absent. However, balloon powered internet could be a potential option as it is able to handle the challenges of rural areas, tough terrains and disaster struck areas, at the same time as being cost-effective. Technology providers and telecom providers are facilitating as internet service providers, with government impetus. While a single balloon has the potential to cover an area of 40km with LTE technology and a connection speed of up to 10Mbps, such an option is a feasible opportunity for developing digital connectivity in North Eastern India.

Commercial Opportunities

While technical opportunities open up, there are a host of investment opportunities. Some of them have been highlighted below:-

Name	Description	Companies
Operation of backhaul	NER from India can attract foreign companies to locate and invest, as well as make their businesses more competitive in international markets in the operation of backhaul, for laying down optical fiber and other related infrastructure. NOFN committee has estimated a total cost of INR72,778 crore for laying down the fiber and other equipment for INR2.5 lakh GPs across India[12].	Potential private players have opportunity to build business models which can build services and applications that can utilise the network infrastructure by installing community Wi-Fi infrastructure, fibre layout etc.
Equipment sourcing	Both public and private players can be called in to supply quality equipment necessary to setup the internet backbone.	Potential private players who can support to build the network infrastructure, including power back-ups, electronics, data centres, network operations centres, etc.

12. Report on NOFN Committee-2015

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Government Schemes

The Government of India along with NIC, DIT and BSNL has taken a bold step under Bharat Net National Optical Fibre Connectivity (NOFN) Scheme to extend optical fibre cable connectivity to provide last mile connectivity to the Gram Panchayat level. However, such an initiative is fraught with policy level and managerial impediments which result in delay and over costs. A snapshot on the progress of the NOFN project in the North-East has been provided below.

State-wise Performance of National Optical Fibre Network (Bharat Net) Project in the North East (As on 18.04.2016)

States/UTs	No. of Gram Panchayats (GPs)-Phase-I	Pipe Laid (In Kms)	Optical Fibre Cable (OFC) Laid (In Kms)	No. of GPs where OFC Laid	No. of GPs Lit
Arunachal Pradesh	256	419	100	22	0
Assam	1013	1955	1763	682	128
Manipur	24	71	73	24	0
Meghalaya	638	988	229	52	0
Mizoram	163	346	4	0	0
Nagaland	743	1631	720	154	0
Sikkim	0	0	0	0	0
Tripura	1021	1440	1153	492	75
India	100200	137440	109203	47882	6661

Source: IndiaStat, 2016. Socio-Economic Statistical Information about India. Available online at: <http://www.indiastat.com/telecommunication/28/telecom/274/network/19279/stats.aspx> [Accessed: July 2016]

From the above table we can conclude that the progress of work under NOFN and USOF has been slow. This procrastinates the deadline of project implementation as well as the project cost. With 68 per cent of NER population living in Assam, work has started there but the absolute growth of internet connectivity in the region has been slow.

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NOFN will connect all Gram Panchayats in NER with optical fibre cable by December, 2016 and provide seamless 100 Mbps broadband connectivity at the GP level[13].

However there are certain priority issues which need to be tackled such as the exemption for movement of equipment and pre-identified personnel related to telecom services from compliance of No Objection Certificates (NoC) and Road permits.

Others include the provision for optical ground fibre for telecommunication services on high power transmission lines of state governments. Road projects should include service ducts for OFC as project.

The private sector has an important role to play in this Digital India initiative of North-East. This includes providing support for unreliable electricity or power back-up within the NER and utilising private sector capacity and global industry experience in order to complete the projects on time whilst using the latest technology. The various telecom, IT, broadband and carrier content providers can contribute at the different levels of intervention such as service layer, back-bone layer, middle-layer network and last mile connectivity layers.

Internet Service Providers (ISPs)

The final tier which connects the end users with the internet backbone are the ISPs at different points of presence (POPs). In the difficult hilly terrains of the North-East Region, establishing these POPs and connecting each Gram Panchayat with the block headquarters and then the state headquarters is a colossal task.

The North-East is majorly connected via SWAN (State Wide Area Network), a government initiative which connects State HQ, District HQ, sub-divisional HQs and Block HQs in order to provide G2G, G2C services. BSNL is mainly the bandwidth provider. It provides services based on data, voice and video communication. A snapshot of the status of SWAN according to DIT department of each of these states has been given below.

Tripura	There are 69 POPs including SHQ under TSWAN[14]
Mizoram	2-34Mbps connectivity provided up to DHQ with 42 POPs completed under MSWAN[15]
Meghalaya	Minimum 2Mbps connectivity provided up to remote 39 BHQs. Future plan to extend it to 8Mbps.
Nagaland	Nagaland SWAN consists of 48 POPs covering 1 SHQ and 10 DHQs. Currently up to 8 Mbps bandwidth is provided. Future provision is of 32 Mbps[16]
Manipur	Under National e-Governance Plan (NeGP), Manipur SWAN is in the implementation phase
Assam	Under PPP model, there are almost 240 POPs at across SHQs, DHQs and BHQs.
Sikkim	SWAN has already been implemented at Sikkim. All government departments are in the process of being networked through optical fibre and radio frequency(RF)[17]
Arunachal Pradesh	AP's SWAN project includes 15 DHQs and 46 blocks in the state. Some of the flagship programmes which have been digitized are Public Distribution System (PDS), driving licenses and vehicle registration, and commercial taxes etc.[18]

13. Digital India, Department of Electronics & Information Technology, Government of India, 2016. Available online at: <https://www.csc.gov.in/index.php?option=com_content&view=article&id=178&Itemid=344)> [Accessed: July 2016]
14. Government of Tripura, Directorate of Information Technology, 2016. Available online at: <http://dit.tripura.gov.in/> [Accessed: July 2016]
15. Department of Information Communication Technology, Government of Mizoram. Available online at: <https://dict.mizoram.gov.in/>[Accessed: June 2016]
16. Department of Information Technology and & Communication, Government of Nagaland. Available online at: < http://itngl.nic.in/> [Accessed: June 2016]
17. Government of Sikkim. 'Sikkim Archives'. Available online at: <https://www.sikkim.gov.in/portal/portal/StatePortal/Department/SikkimArchives> [Accessed: June 2016]
18. iGovernment 2013. 'Arunachal launches SWAN project'. Available online at: <http://www.igovernment.in/articles/32867/arunachal-launches-swan-project>[Accessed: July 2016]

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Technical opportunities

Given the poor to meagre telecom infrastructure in the North-East and the high cost of communications in the mountainous region, expansion plans are difficult. To establish an ISP, investments are required in basic equipment like computers, modems, telephone lines, terminal servers, routers, leased lines, satellite base stations, manpower, office space and marketing. If more people connect to an ISP and remain connected for longer, the more cash will flow in to the telecom industry making such investments viable.

In order to improve ISP service, they need to map the subscriber usage. More penetration of computer based trainings and ICT education can propel the growth of ISP services. This is turn makes internet consumption affordable, making the market much more effective for both the private and public players. Timely measures can make the dream of digital North-East India a reality.

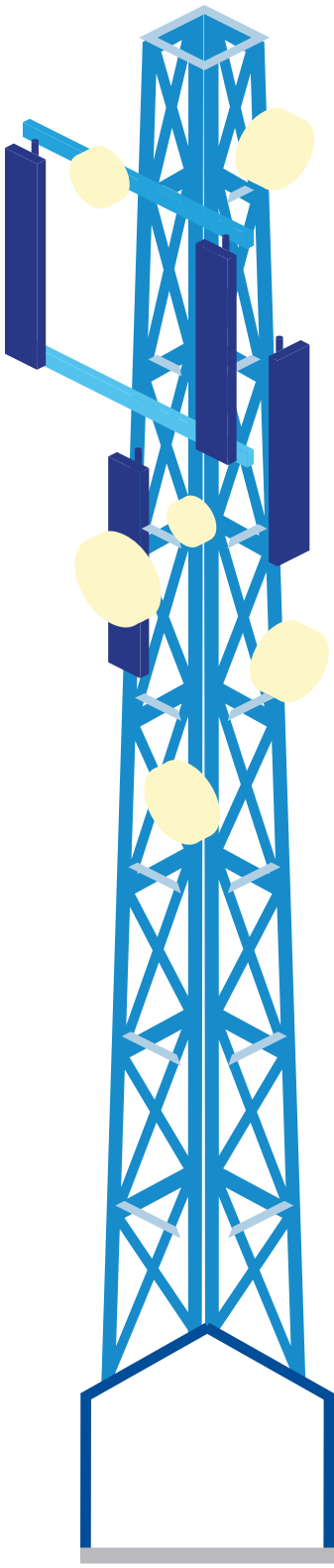
Commercial Opportunities

With technical opportunities come the commercial opportunities which lie in the domain of attracting email providers, private telecom players, cable operators, publishers and newspaper companies to invest more and more in this industry. With a forecasted population growth of 16.09 per cent in 2021 compared to 2011 and few of the states having Gross State Domestic Product (GSDP) at 9.7 per cent (Meghalaya), 8.9 per cent (Arunachal Pradesh) and Tripura (figures of 2013-2014), and a wide mix of cultural and regional activities, North Eastern markets provide a vibrant opportunity for effective return on investment[19].

A good ISP ensures a smooth registration, provide personal home pages and websites. Having greater number of ISPs also makes the region much more attractive for business. In the North-East, VSNL and MTNL have been the major ISP providers. A collaborative participation of both public and private can make this effort successful. Shared business models can be executed among service providers to reduce cost and increase the revenues of the ISPs.

Government Schemes

- Under NeGP SWAN scheme, DIT and NIC along with BSNL are implementing SWAN to provide online government services directly to the public. Site identification and handing over to network operators are the major challenges for the operationalization of such schemes. The limited penetration for telecom providers and lack of reliable connectivity are also the major impediments for most of the states in the North-East. Proactive facilitation of ROW permissions, site clearances order and enhancement of bandwidth can attract more private players and create a competitive market in the region.
- Special financial subsidy can be given to telecom players providing bandwidth in the region
- The government can also encourage an open market policy for data centres and ISPs which can bring down the internet transit cost thus allowing end users to consume internet at an affordable rate.



19. Business Standard, 2016. 'India's fastest-growing state: Meghalaya (and other North-East surprises)'. Available online at: <http://www.business-standard.com/article/specials/india-s-fastest-growing-state-meghalaya-and-other-north-east-surprises-116020100274_1.html>[Accessed: July 2016]

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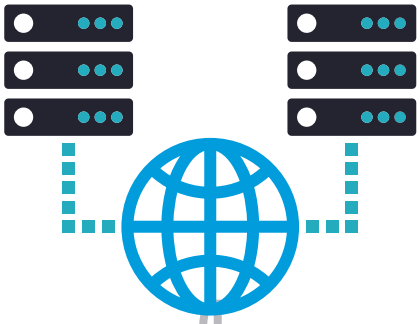
Data Centers

Data centers are part of the key infrastructure for a knowledge based economy, and play a pivotal role in the development of information and telecommunication.

State Data centers (SDCs) have been the key infrastructure to provide efficient delivery of services for Government to customer (G2C), Government to business (G2B) and Government to Government (G2G) services across the North Eastern states. These services are rendered through common delivery platform by connecting with SWAN (State Wide Area Network) and CSCs (Community Service Centers) with connectivity up to the block level. The ideal uptime of these DCs is 99.74 per cent.

While every state in the North-East has state data centers under NeGP scheme, there are opportunities of improvement in space and power optimization and optimization in IT infrastructure like server and storage optimization etc. Most of the DCs are operating in Tier-2+ standards. Besides state facilitated DCs, with the upcoming broadband link in Agartala, there is opportunity for private enterprise DCs in order to develop IT hubs in the North East and provide storage and sever facilities to SMEs, MSMEs, industries and retail players in North East.

Below is a picture of SDCs in the North-East under the NeGP scheme –



- **Mizoram** — Prithvi Info bagged the Mizoram SDC project in 2011 for 5 years[20]
- **Tripura** — SDC commissioned on 24.12.2010 and hosts 100 applications and websites of 50 different state govt. departments/organisations [21]
- **Manipur** — SDC operational with eight government department utilizing MSDC infrastructure for hosting their respective applications
- **Nagaland** — NSDC currently hosts applications like State Portal State Services Delivery Gateway, File Tracking System, Online Inner Line Permit, Vigilance Department, Economics & Statistics, Finance department, Election Department, crime & Criminal Tracking Network System (CCTNS), food & Civil Supplies, department of Soil & Water Conservation, department of Information & Public Relations[22]
- **Meghalaya** — MSDC hosts 27 applications/websites from various state departments. Disaster recovery Storage Replication has been set-up with National Data Center New Delhi. Cloud Based hosting has also been implemented
- **Assam** — Assam State Data Center located at Dispur is connected to SWAN and internet cloud. It's services are available throughout the state to various State Govt. departments and agencies including CSC operators
- **Sikkim** — The Sikkim data center hosts Sikkim Open Data Acquisition and Web Portal which applies to all data created by various departments/ministries/departments/ organizations with OLAP(online analytical processing) capabilities[23]

20. Department of Information Communication Technology, Government of Mizoram. Available online at: <https://dict.mizoram.gov.in/>[Accessed: June 2016]
21. Government of Tripura, Directorate of Information Technology, 2016. Available online at: <http://dit.tripura.gov.in/> [Accessed: July 2016]
22. Department of Information Technology and & Communication, Government of Nagaland. Available online at: < http://itngl.nic.in/> [Accessed: June 2016]
23. Government of Sikkim. 'Sikkim Archives'. Available online at: <https://www.sikkim.gov.in/portal/portal/StatePortal/Department/SikkimArchives> [Accessed: June 2016]

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Technical opportunities

Name	Description
Core Data Center infrastructure	With focus shifted to digital, computing devices are being built at the core i.e. DCs. With huge amount of data being generated from multiple devices, it is important to increase the capacities of the data centers. They are now important for central repository, data storage, and online delivery of services, hosting state intranet portal, disaster recovery and remote management. Design, site preparation, supply, installation, commissioning, maintenance are other integral operations of DCs. Thus focus should be to invest more on reliable, secure and efficient Data centers in order to digitize the North-East
Software defined data centers	Going ahead, opportunities lie in software-defined data centers where storage, networking, security, and even the data center layer itself should be delivered as a service. Data Center platforms need to be designed to control and manage cloud platforms at a truly agnostic level Cloud Management and data center controls should be intertwined where cloud becomes a powerful extension of the Data Center Environment
Disaster Risk Enabled Data Centers	SDCs can be made Disaster Risk enabled through a concerted government and private initiative

Commercial Opportunities

Name	Description	Companies
Investment in data centric companies	The North Eastern states' strategy should be to meet the needs of the data-centric companies which can transform the banking sector, telecom, hospital, public utilities etc. by providing data processing capabilities to already operational companies in the U.S., Europe etc.	Large, medium and small scale tech companies providing data analytics, mining and data processing support
Green Data Centers	Investments in green data centers is another upcoming area which investors can look into.	Data center companies showing tendency to favor renewable sources of energy such as wind and power to generate energy for their technology while keeping the cost of running the data centers down.

Government Schemes

Under National e-Governance Plan, mission mode projects have been undertaken in the health, education, PDS and Posts sector. Key core infrastructure components like CSCs, SDCs, SWANs, and SSDGs (State Service Delivery Gateways) and State Portals have been connected. However Data center generates low economic value if the internet that connects it is too unreliable for business to depend on. Thus prioritizing broadband should be the foremost activity.

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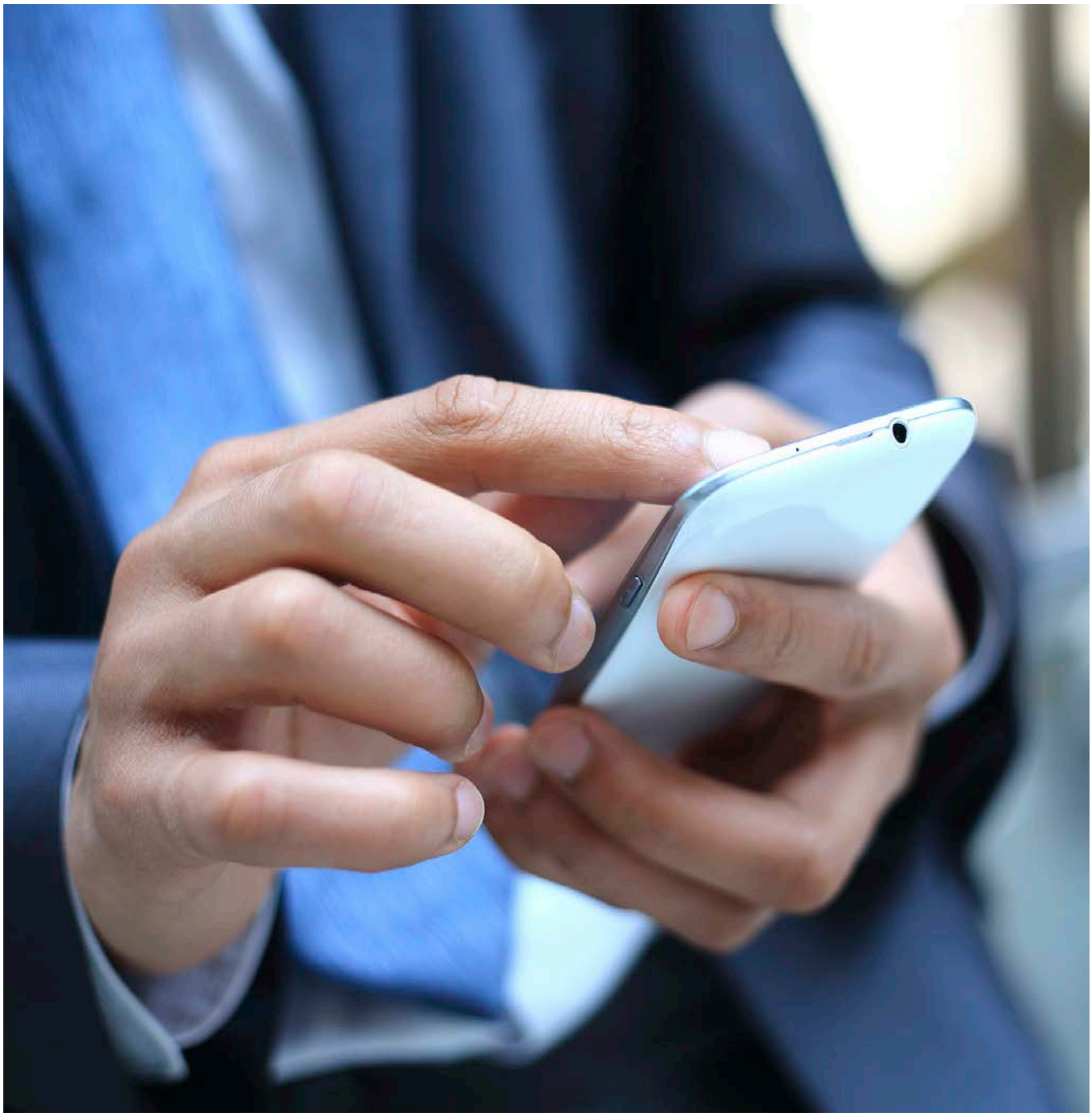
Mobile Connectivity

Last but not the least, last mile connectivity is only possible if devices have connectivity. With the growing affordability of smartphones, the mobile has been a ubiquitous device to provide exhaustive services to the public at large. Additionally the high penetration of mobile devices has enabled business both small and big to flourish. Thus the pivotal task of all telecom players in the North-East is to cover all inhabited villages by 2G mobile connectivity and seamless 2G mobile connectivity on National Highways in NER by March, 2017. A reduction of tariffs and providing subsidies for smartphones to get more smart devices into homes can be additional efforts undertaken by the governments. They can also consider issuing a larger number of telecom licenses to increase coverage and encourage competitive pricing.



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Citizen readiness

Given that our basic ICT layer has been set-up, it is imperative to build the citizen layer without which we will not be able to build the IT hub. This encompasses the development of a community which provides a support for the next layer which is the ICT layer or the IT hub layer. The citizen layer mainly includes initiatives in education, healthcare, entertainment sectors and a hospitable environment without which the ICT layer won't be able to thrive.

Education

A number of Universities in North Eastern India are already producing IT professionals. Some prominent projects are[24]:-

1. IT Entrepreneurs Training Course – It is implemented by Tripura State Council for Science & Technology in association with DOEACC, with the objective of developing IT entrepreneurs by imparting IT skills, soft skills and promoting entrepreneurship. So far, ten centers have been set up and 3,000 candidates have been trained so far.
2. Learning Management System (LMS) for Rural Development - The project is being implemented by RD for capacity building of Panchayat functionaries. The Project is to develop and implement a web-based Content Management System, which needs to have user management functionalities. The training would be given in English & Bengali.

Further initiatives which can strengthen the education sector of North Eastern states and which government is already looking forward to are enumerated below:-

- Higher number of educational universities in terms of engineering colleges need to be established which can provide greater IT skill, an impetus to set-up IT industries
- The Department of Science and Technology has approved a comprehensive solution for the Sarva Shiksha Abhiyan covering power supply through solar, wind power and inverters
- Promotion of digital literacy including the preparation of digital literacy modules in regional languages by 2016
- Establishment of Film and Television Institute in Manipur by Mio I&B
- Vocational education for skilling youths.

Below is a snapshot of universities present in the North Eastern states of India

Number of Private and Government Colleges in the North East (2012-2013)

States/UTs	Private Un-Aided	Private Aided	Total Private	Government	Total
Sikkim	5		5	6	11
Tripura	4	2	6	39	45
Nagaland	9	29	38	20	58
Mizoram	1	1	2	27	29
Meghalaya	10	12	22	14	36
Manipur	15	15	30	39	69
Assam	29	12	41	265	306
Arunachal Pradesh	4	2	6	8	14
India	14042	3584	17626	6494	24120

Source: IndiaStat. 'Socio-Economic Statistical Information about India: Education'. Available online at: < http://www.indiastat.com/education/6370/educationalinfrastructure/207091/niversitiescollegesinstitutionsforhighereducation/369742/stats.aspx> [Accessed: July 2016]

24. Centre for Development of Advanced Computing, 2016. Available online at: <http://cdac.in/index.aspx?id=north_east_initiatives> [Accessed: June 2016]

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HealthCare

In order to support the IT talents and hubs in the North Eastern states, one of the critical components of the supporting community structure is quality healthcare. There is a lack of quality healthcare in the North Eastern states. Deficiencies in health human resource (manpower) are prominent across the region. States like Mizoram, Nagaland and Arunachal Pradesh do not have any medical colleges[25]. Establishment of medical colleges can improve the doctor-to-population ratio.

Entertainment

The third angle of a community structure to support the ICT sector in the North Eastern states is entertainment. This includes sights, proper transport facilities, restaurants, events, activities, shopping, tours etc. Though North-East is a major tourism hub but options for weekend outings at walkable distances are very few. Attracting retail players to commercialize areas of the North-East to set up entertainment parks, malls, cafes etc. will be a step forward to attract young talent to work in the region.

Indian cities like Pune, Bangalore, and Chandigarh provide many options for weekend outings due to their geographic advantage.

A case in point can be Jaipur, a Tier-2 city which is being seen as a rising IT Hub for fresh young talent, STPI exports of around 410 crores (2010) and 50% software export growth (2009-2010). The major key drivers were:-

- Flourishing infrastructure with the construction of Mahindra World City (India's largest integrated IT SEZ) and World Trade Park.
- A good service provider ecosystem due to presence of all major service providers
- A 20-40% cost advantage in commercial real estate costs
- Due to city's proximity to NCR, Jaipur can be grown as supporting location to create hub & spoke model
- It has excellent weekend options, many weekend outing options and a low crime rate
- Some of the major IT players present here are Wipro, Infosys, Tech Mahindra etc.

Hospitable Environment

Few parameters make living in a city sustainable. These are:-

- Average to good transportation infrastructure
- International Airport
- Physical and Civic infrastructure
- Hotel infrastructure
- Climate and pollution levels

In tier -2 cities like Jaipur, Nagpur and Chandigarh, various metro rail projects have been undertaken. Tier-2 cities typically suffer from poor to zero international connectivity especially to USA and Europe countries. Ahmedabad was ranked best city in India in terms of civic infrastructure by survey done by Times of India-IMRB (2011). Hyderabad, Pune, Trivandrum, Jaipur are few of the places that exhibit excellent climate, good cultural diversity and low pollution levels and thus provide a hospitable environment to attract young talent.

North Eastern states offer a soothing climate and picturesque landscape but in terms of transport connectivity, a greater measure of development is necessary.

North Eastern states offer a soothing climate and picturesque landscape but in terms of transport connectivity, a greater measure of development is necessary.

25. IndiaStat. 'Socio-Economic Statistical Information about India: Education'. Available online at: < http://www.indiastat.com/education/6370/educationalinfrastructure/207091/universitiescollegesinstitutionsforhighereducation/369742/stats.aspx> [Accessed: July 2016]

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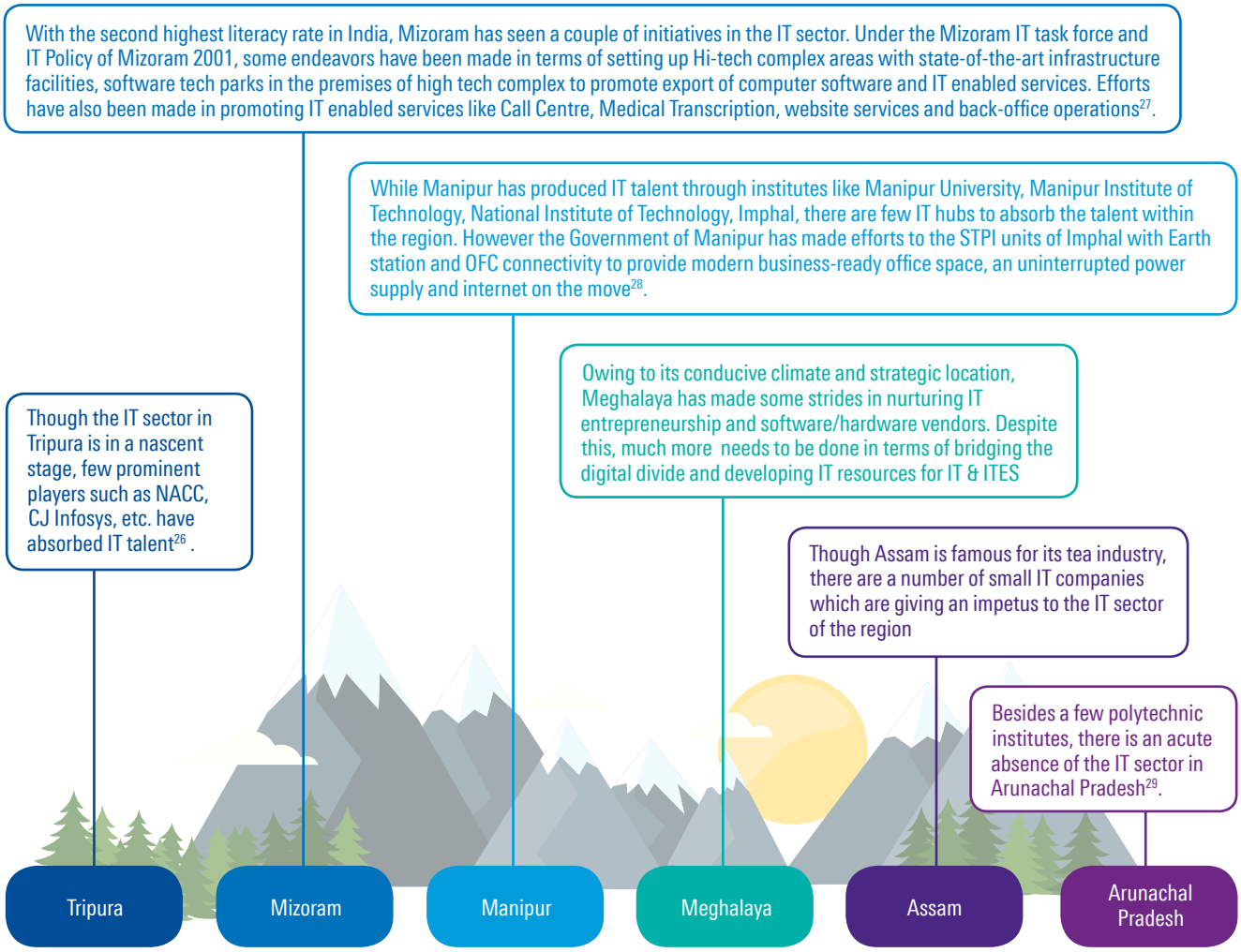
ICT industry

With an effective ICT infrastructure and community to support it, it becomes easier for IT players and SMEs to establish their offices and attract young IT talent to stay and work. The North-East has seen a couple of IT initiatives in some of the states- which are captured below:-



Thus with the current scenario of IT hub in the North Eastern states, much needs to be done to develop the sector. Under government's NEBP BPO scheme, BPO employment opportunities in the NER has generated some buzz and will attract some bids. But to make this scheme successful in its entirety, the government needs to go a step ahead and build confidence among clients in countries such as the U.S. and U.K. about the service being provided to them from small towns. This will come from extensive marketing, both digital and traditional. It will in turn boost confidence among the big IT players to set up such centers in these remote states of the North-East. Besides there should also be some relaxation in the subsidy policy including perhaps allowing bidders to provide a bank guarantee on the subsidy before setting up operations at these small cities and towns. This will help to alleviate the liquidity concerns faced by companies. Additionally power subsidy, subsidy on capital investments on land, machinery and confidence on protectionism from extremist activities can help attract major telecom players to effectively tap the abundant English speaking talent in the North-East.

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26. Government of Tripura, Directorate of Information Technology, 2016. Available online at: <http://dit.tripura.gov.in/> [Accessed: July 2016]
27. Department of Information Communication Technology, Government of Mizoram. Available online at: <https://dict.mizoram.gov.in/>[Accessed: June 2016]
28. Department of Information Technology, Government of Manipur. Available online at: <http://ditmanipur.gov.in/> [Accessed: July 2016]
29. iGovernment 2013. 'Arunachal launches SWAN project'. Available online at: <http://www.igovernment.in/articles/32867/arunachal-launches-swan-project>[Accessed: July 2016]

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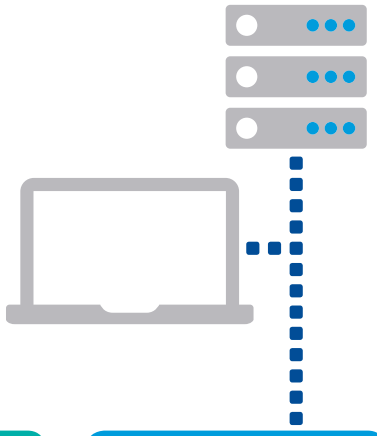
Digital

This layer mainly encompasses advanced broadband technologies including LTE and 4G, cloud, big data and Internet of Things (IOT). Whereas achieving an exhaustive digital economy in the NER is a time consuming vision, but incremental efforts can be made to achieve this vision. Few of them have been highlighted below:-



Technical opportunities

Broadband

The way ahead is deployment of LTE-based 4G technology where tower deployment is easier and cheaper. Due to constraints of space, power and funds in the North East, 4G offers solutions addressing all issues. The 4G BTS are very small in size and require very less power for operation, approx. 20W. Moreover, they can be installed on poles rather than towers. The 4G network is also a roll back network i.e., it supports 3G, Edge, GPRS as well as 2G.With additional spectrum, operators can also go for Wi-Max.

Cloud services

This is the distribution model for mass market access to computing and storage facilities. Telecom, ISP, e-commerce and other small SMEs have an immense opportunity to host services on the cloud with further development in broadband connectivity in the North Eastern states.

Big data

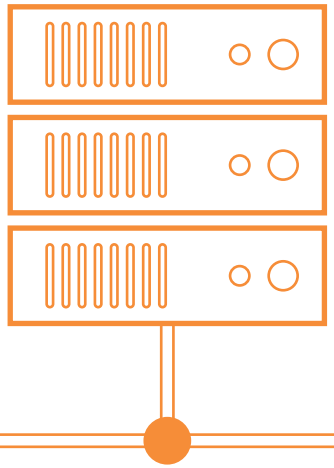
With applications generating huge data, economies are monetizing this data and converting data into information and insights. With increasing demand in the banking, insurance, retail and telecom sector, big data is likely to eventually become a big business. Thus with traditional industries present in the North-East using an online platform to buy and sell their products, big data analytics could provide a greater insight regarding the customer base, market segmentation thus enabling better marketing of products to target user groups and the development of relevant products

IOT

With smart cities coming up in the North-East, sensor and actuator networks for data collection and response actions will help in improving community living standards in terms of traffic, waste, water management among other aspects of civic life. Thus though IOT remains underdeveloped there at this stage, in order to leapfrog to a data innovation centric and digital economy, it needs to be deployed soon. It will additionally enhance the gains of GDP of the economy from ICT investments.

Commercial Opportunities

- Investment in supplementary technologies like 3G, 4 G, Wi-Max and Wi-Fi infrastructure
- Private businesses need to focus on the cloud, big data and IOT in order to increase productivity and achieve scaling benefits of digitization in NER region
- Investments from private parties in ICT in order to drive broadband adoption in NER. Greater investments can intensify competition in the region thus driving up the quality of the internet service. With better quality of service, certain sectors can rapidly develop like media and entertainment
- Better quality of services will lead to further development in network upgrades leading to a virtuous cycle of investments
- To overcome infrastructural challenges in laying fixed networks, investments should be centered on mobile technology rather than landlines
- SMEs can adopt cloud computing and use ICT to transform business or develop e-commerce
- Small and medium cooperative banks can use cloud computing to deploy core banking solutions to improve efficiency and profitability.



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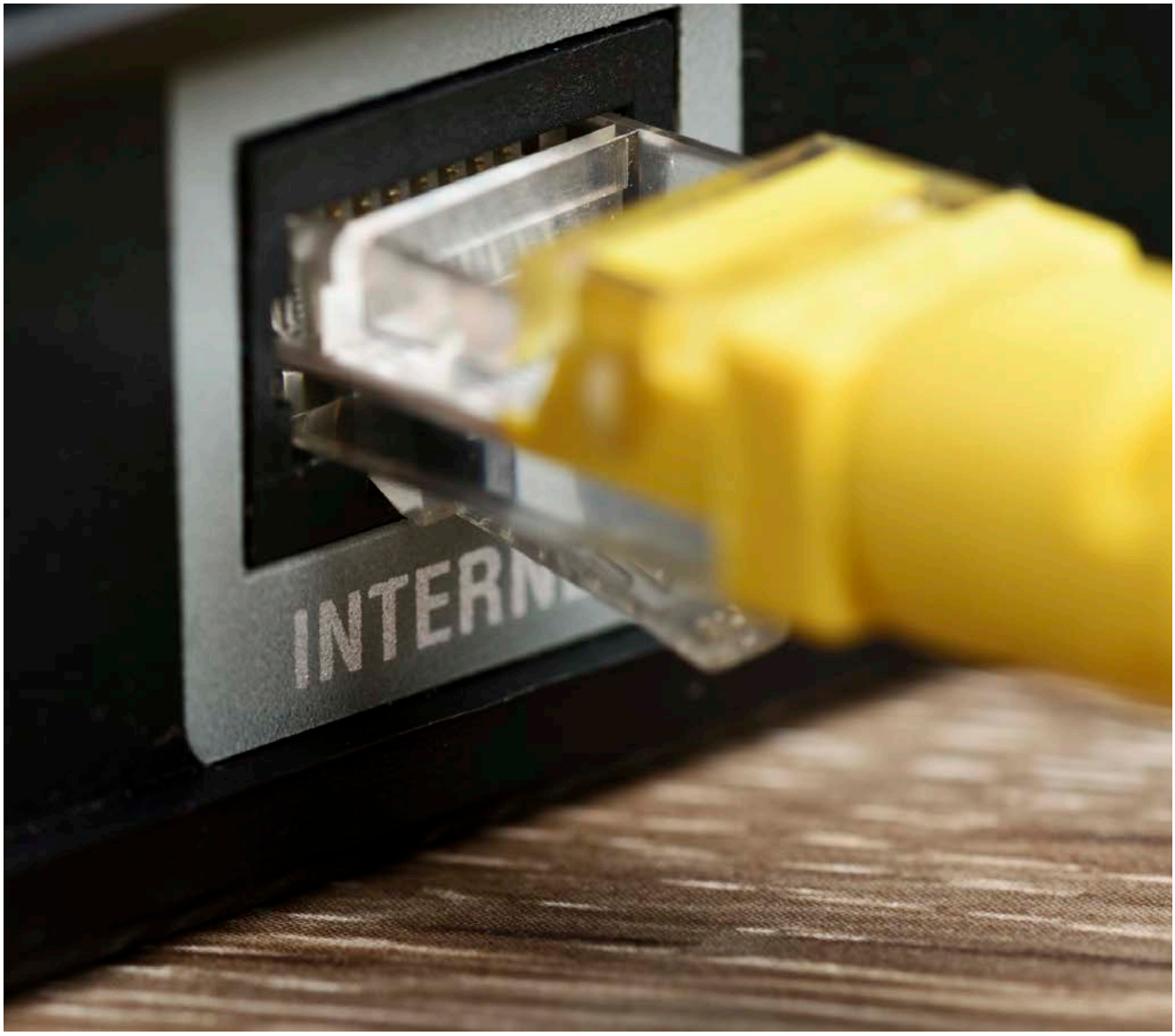
Government Schemes

- Under the government's Digital India concept, NER has already taken the step forward to connect places with OFC which will bring the much needed broadband connections to private home, businesses and industries. However, the broadband market should be opened in order to allow new players to deliver services over the nationwide optic fibre network which can in turn result in a slew of broadband packages at competitive prices for cloud access
- For cloud security, government can also adopt a multi-tiered cloud security framework approach which can provide flexible approach to enterprises to choose the security level
- Governments need to take the lead in digitally transforming themselves, driving cross-industry collaboration, and building long-term partnerships with the private sector and the financial world to create a robust ICT ecosystem.



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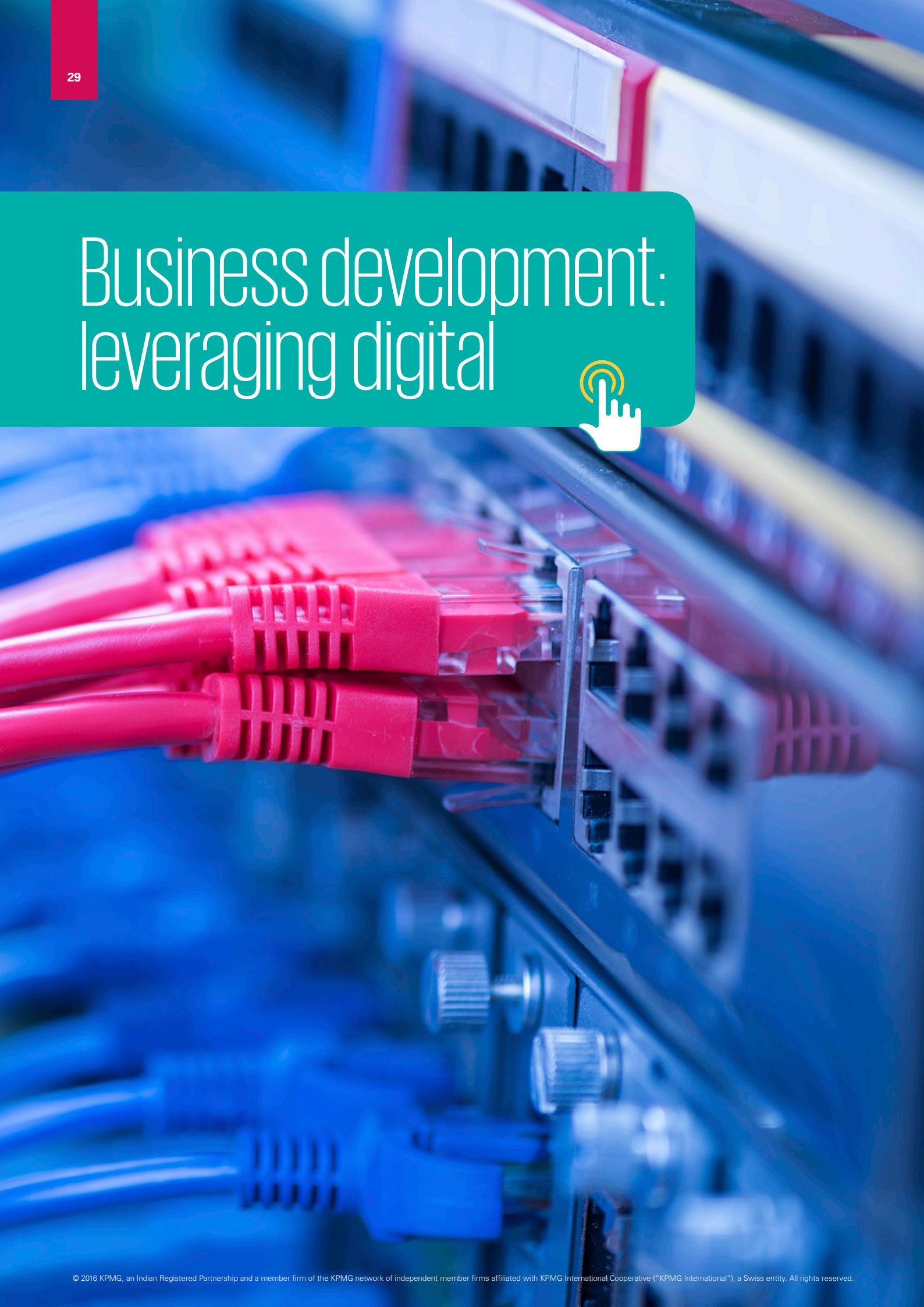
Business development: leveraging digital



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With the Basic Internet, ICT, citizen and digital layers in place, a favourable and facilitative business environment can develop in the NER, providing several opportunities for industries to flourish. As citizens' experience improved basic infrastructure and increased physical and digital connectivity, the quality of life will increase, markets will widen and new economic and employment prospects will arise. The region will emerge as a hub for entrepreneurship and investment as new and existing enterprises grow. Arguably, a well-supported and developed ICT and Digital sector will have a positive impact on industry development and in enhancing the attractiveness of the NER.

Based on KPMG in India's analysis, there are several key industry sectors that can flourish, particularly through leveraging improved ICT and digital technologies in the NER.

The industries that have been identified for increased efforts and focus include:

Not only this, due to the increased focus on enhancing both economic and strategic ties between the NER and neighboring countries, there are several opportunities that can be exploited for mutual sub-regional benefits. These prospects are identified towards the end of the chapter.

ICT sector

With the Digital India campaign and Bharat NOFN project setting up ICT infrastructure in the North-East, Community Service Centers under SWAN scheme are already providing e-governance services to the people of the Region.

Community Service Centers (CSCs)

DIT (Department of IT) has taken up a project along with NIC (National Informatics center) and the state governments of the NE to provide CICs per block in all the NE states and Sikkim. The project objective is to address the basic needs of citizens such as information, education, entertainment and health services through CSCs.

IGNOU has been assigned to develop awareness among people about the courses to be provided through CICs[30]. Though CICs have significantly improved the lives of people in North Eastern India there are a host of challenges ranging from power shortage problems, lack of human resource for CIC operations, management of peak time demand requirements, bureaucratic processes inhibiting equipment gathering, meeting state level requirements etc.

Number of Common Service Centres (CSCs) As on 31.01.2012

State	CSCs to be set up	31.01.2012
Tripura	145	145
Arunachal Pradesh	200	200
Assam	4375	3881
Manipur	399	399
Meghalaya	225	214
Mizoram	136	118
Nagaland	220	198
Sikkim	45	45
India	126949	97159

Source: Common Service Centres (CSCs). Available online at: <Indiastat.com> [Accessed: July 2016]

30. Indira Gandhi National Open University, 2015. 'Associate Projects'. Available online at: < http://www.ignou.ac.in/ignou/aboutignou/project/2> [Accessed: June 2016]

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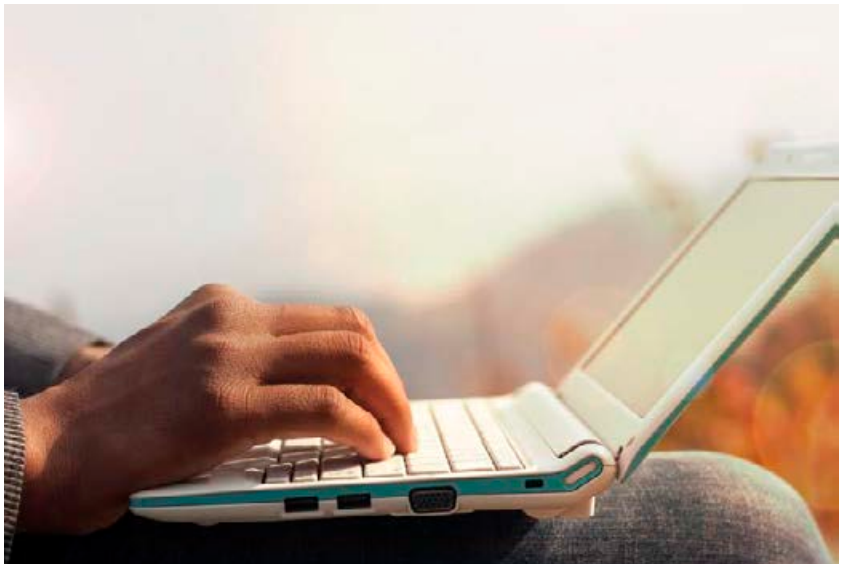
Recommendations

- The training courses provided by CICs should be accompanied by certification in order to generate employable skills
- Integrate CICs with the education system of NER which encompasses schools and universities
- Integrate CICs with State Wide Area Networks
- Planning of CIC roll-out can be done at the state Level instead of the national level
- Planning should include power requirements
- A proper MIS can be integrated with CICs in order to generate real time reports of performance.



BPO-ITES current scenario

India has emerged as an important outsourcing destination, considering software and IT-enabled services as a significant activity for the economy[31]. Currently however, the presence of the IT industry including BPO-ITES operations in the NER is very limited, consisting of only a small number of private companies in each state that support local requirements.

An increased emphasis on developing the Business Process Outsourcing (BPO) and IT-Enabled Services (ITES) industry will require the introduction of policies to facilitate supporting ICT infrastructure and growth of the telecom sector. MSME and SME's will have the chance to flourish if supporting training centers are available.

The Ministry of Micro, Small and Medium Enterprises (MSME) in the North Eastern Region has set up various programmes aimed at providing assistance to MSME's. This assistance is in the form of seminars, industrial campaigns, feasibility reports and area survey reports[32].

Previously, bottlenecks to the establishment of BPO operations have included unreliable internet connectivity and power supply[33]. With this, many BPO companies in India have opted to set up in Tier-I cities which have a reliable connectivity network. However, with the introduction of widespread broadband and telecom connectivity, BPO companies can set up in not only Tier-I cities but also more remote, Tier-II/III cities in the NER, reducing manpower expenses and essentially, making operations more cost-effective. The availability of workforce across the NER is a prime reason for companies to start operating in more remote areas. Providing a reliable broadband network is an urgent requirement for the NER to tap into the pool of talent and create multiple opportunities for employment and attracting investment ventures.

MSME Development Institutes set up in the North East Region

State	Region
Sikkim	Gangtok
Assam	Guwahati
Manipur	Imphal
Tripura	Agartala

Source: EXIM, 2015

31. Reserve Bank of India, 2015. 'Survey on Computer Software & Information Technology Enabled Service Exports'. Available online at: < https://rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=15452> [Accessed: May 2016]
32. Export-Import bank, EXIM, (2015). Pp. 96
33. Business Standard, 2016. 'Centre's 'Digital India' programme aims at promoting BPO-ITeS Industry in North East'. Available online at: < http://www.business-standard.com/article/economy-policy/centre-s-digital-india-programme-aims-at-promoting-bpo-ites-industry-in-north-east-116020100571_1.html> [Accessed: June 2016]

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Schemes currently in place:

To promote the NER as a viable location for BPO and ITES firms, the government of India under the 'Digital India' programme has approved the 'North-East BPO Promotion Scheme' (NEBPS) with an outlay of INR50 Crore during the remaining period of 12th Five Year Plan[34]. Capital support will be in the form of Viability Gap Funding (VGF). The initiative envisages the NER as a back-office hub, generating employment, particularly for the youth, through the development of BPO and ITES operations.. Special incentives have also been secured for example training support, local entrepreneurs and employment of women. Incentives for companies addressing inclusion and diversity are as follows:

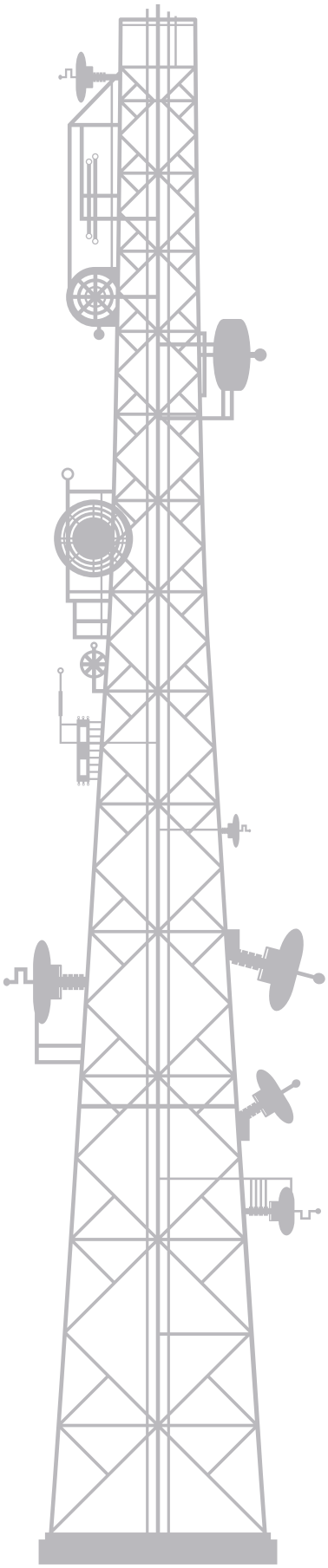
Inclusion and Diversity	Incentive (% of eligible capital support)
50% women employment	5%
75% women employment	7.5%
4% employment for persons with disability	2%

Source: Ministry of Communication and Information Technology, 2016

To encourage the growth of SME's, a special incentive for companies setting up BPO/ITES operation as a consortium with local entrepreneurs is provided (at 5 per cent of eligible capital support)[35]. Such support must continue to be provided to the NER and benefits must be measurable.

Growth Drivers – Key Opportunities through leveraging ICT:

- Call centers and data processing centers can be expanded to help the North-East become an attractive environment for investment opportunities
- BPO companies can set up in Tier-I,2 and 3 cities in the NER
- Public and private investment can participate in the laying down of optical fibers to connect even remote areas in the NER
- Foreign telecom companies can invest in telecom infrastructure
- Encourage MSME presence and number of local entrepreneurs to grow in the NER, particularly given the high availability of skilled workforce and the prevalence of English as the general medium of instruction
- Digitally-integrated payment platforms could provide financial inclusion and further opportunities to SME and MSME's for entrepreneurial activities in the region
- With developments in the telecom sector, additional services could have an increased presence in the future including monitoring of ATM machines, surveillance, traffic management and grid energy, in order to optimise resources[36].



34. Business Standard, 2016. 'Centre's 'Digital India' programme aims at promoting BPO-ITeS Industry in North East'. Available online at: < http://www.business-standard.com/article/economy-policy/centre-s-digital-india-programme-aims-at-promoting-bpo-ites-industry-in-north-east-116020100571_1.html> [Accessed: June 2016]
35. Ministry of Communications and Information Technology, 2016. RFP: 'Implementation of North East BPO Promotion Scheme (NEBPS). Available online at: < https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjHksqykP3NAhUT5mMKHddOAmUQFggeMAA&url=https%3A%2F%2Fwww.stpi.in%2Fwritereaddata%2Fmainlinkfile%2F4564974058nebps.pdf&usg=AFQjCNHClR3bqYsji216QjUPXK_Dd0xv8Q> [Accessed: July 2016] Business Standard, 2016. 'Centre's 'Digital India' programme aims at promoting BPO-ITeS Industry in North East'. Available online at: < http://www.business-standard.com/article/economy-policy/centre-s-digital-india-programme-aims-at-promoting-bpo-ites-industry-in-north-east-116020100571_1.html> [Accessed: June 2016]
36. ASA & Associates, 2012. 'A Brief Report on Telecom Sector in India'. Available online at: <http://www.asa.in/file-download?file=%2FUpload%2FfIdInsights%2FTelecom-Sector-in-India.pdf&mac=guOV5rsZqtvin%2BvO9mkVkp4jvHX70r3fX8iNRlW9F1c%3D> [Accessed: April 2016]

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Smart cities

With ICT solutions in place across the NER, smart cities that have already been earmarked can experience increased growth. The 7 North Eastern states and Sikkim have been selected and included in the upcoming 100 Smart City Project.

Scheme currently in place:

The government of India has a vision of developing 100 smart cities as satellite towns of larger cities and by modernising them for a citizen-friendly and sustainable environment. The concept of Smart Cities is projected to improve the standard of living through smart solutions. A total of INR980 billion (US$15 billion) has been approved by the Indian Cabinet for development of 100 smart cities and rejuvenation of 500 others[37].

Amongst the list of the 100 cities shortlisted by the Center includes a number of States from the North Eastern Region. These proposed smart cities include:

Name of State/UT	Names of Cities Shortlisted
Arunachal Pradesh	Pasighat
Assam	Guwahati
Manipur	Imphal
Meghalaya	Shillong
Mizoram	Aizawal
Nagaland	Kohima
Sikkim	Namchi
Tripura	Agartala

Source: Smart Cities Projects, 2015. Available online at: < http://www.smartcitiesprojects.com/list-of-nominate-cities-developed-as-smart-cities-amrut-cities/> [Accessed: June 2016]

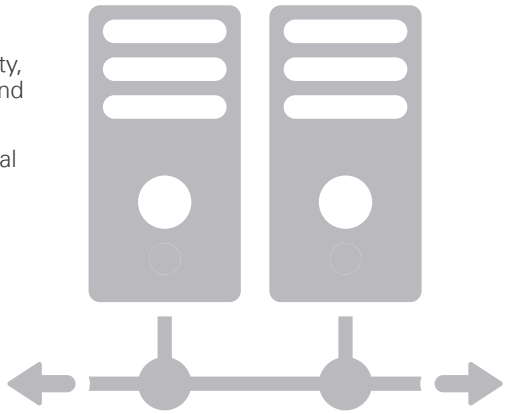
There are several initiatives that could be taken up in the North-East Region including:

- Highest impact ICT-enabled infrastructure and services projects in alignment with smart-cities
- Digital infrastructure and city-wide Wi-Fi which can be funded through private player investments, municipal funds, state funds and Viability Gap Funding (VGF)
- Policies and regulatory frameworks must facilitate innovative citizen service delivery models
- Recreational gardens and parks as well as sporting infrastructure such as sports clubs, stadiums and playing fields.

Growth Drivers – Key Opportunities through leveraging ICT:

With the smart city initiative the government aims at improving the standard of living of the citizens in the area. This includes leveraging a number of interventions-ICT and digital technologies, public private partnership (PPP) and other policies to the different aspects of livelihood such as adequate water supply management, sanitation facilities, affordable housing, sustainable environment, efficient urban mobility, safety and security of the citizens and good governance.

- Encourage investment to the local economy
- Apply smart solutions to infrastructure development for example through disaster prevention.



37. ORF Issue Brief, 2016. 'Transporting Masses in Urban India: Policy & Fact Disconnect'. Issue No.140. Available online at: < http://www.orfonline.org/wp-content/uploads/2016/05/ORF_Issue_Brief_140_Vibhuti.pdf> [Accessed: June 2016]

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E-services

E-Services will provide the much required citizen and government communication which will increase transparency and accountability of governments to their citizens.

E-Services can ensure even those in the most remote areas of the NER have access to services that can improve their quality of life. This will only be possible through digital platforms in which government websites must be easy to use and available in local languages.

Sector	Type of E-service	Potential benefits to citizens and industries
Banking and financial services	E-wallets, Mobile Payment solutions	• Financial inclusion of the rural population • Easy loan disbursement, money transfer and deposits • Expansion of small-enterprises into medium-large industries
Retail	Marketplace for producers and buyers	• Access of goods to buyers not limited by geographical constraints • Access to greater variety of goods locally produced • Affordable consumption of goods and door-step delivery • Promotion of competition among sellers and producers
Education	Digital literacy platform	• Easy access to virtual classrooms • Facility to get online certification for industry recognized courses
Self-employment	Facility to have income from e-based platforms	• Freelancing opportunities • Consulting opportunities • Ad promoting agents for corporates
Healthcare	Telemedicine	• Last mile connectivity to patients • Automation of patient documents and appointments • Virtual medical assistance from doctors and consultants
Communication	E-chat platforms	• Video call, voice chats to reduce distance between people to people connectivity making it much more affordable • Facilitate competition among data service providers and content makers
Community Services	E-governance	• Access to public services like lodging complaints against any public servant, access to identity documents, access to government schemes, price discovery of crop by farmers, weather related information, etc.

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Textile industry

North-East India is known for its rich natural and cultural heritage; a region in which handloom weaving and attractive handicraft production is a way of life. Small-scale and agro-industries dominate the region but they have been unable to expand to a level which allows them to compete in the market on a larger scale.

Despite this, these economic activities constitute an important part of people's livelihoods across the NER. The Ministry of Textiles continues to earmark 10 per cent of its total budget for the North-East according to 12th Five year Plan[38]. However, the industry itself requires modernization efforts through digital technology, to tap the potential, effectively market products and increase export earnings. E-Commerce has become an important business tool to effectively reach larger markets, achieve economies of scale and increase commerce through a digital platform. Weavers and artisans must be made aware of the requirements for fashion and adapt to changing demands.

The main challenges associated with the textile industry in North Eastern India include:

- Small-scale industries continue to produce old designs and are thus unable to meet modern demand due to poor awareness of markets and changing demand patterns
- Limited trained and skilled manpower to operate machinery or to manage large-scale production
- Capital in the region is scarce which has prevented the expansion of medium and large-scale industries
- Lack of credit facilities is a significant problem for small-scale industries that are unable to expand
- Poor marketing knowledge and marketing facilities; large quantities of products would be unable to reach more widespread markets
- Lack of training and training facilities for encouraging development and growth in small-scale industries

Government Schemes

Despite facing multiple challenges including a lack of training and credit facilities amongst others, the textile sector provides an opportunity for growth, employment generation and export diversification. The government of India- Ministry of Textiles has come out with NER textile promotion scheme(NERTPS) according to which it aims to develop and modernize the textile sector in North-East through technology up gradation, better access to domestic and export markets, market access and market promotion. Some of the interventions are:-

- Establishment of textile clusters and parks
- Up gradation of power loom units with modern shuttle less looms on hire purchase and projects for technology up-gradation of the existing power loom /handlooms units
- Skill Development Projects and projects for the development of sericulture, handicrafts, technology up-gradation of handlooms and other textile activities

Commercial Interests

There are different ways by which private players can contribute to modernize this industry in the North-East and thus become profitable in the process. Some of them are mentioned below:-

- While the government has already implemented ways to digitize the handloom industry by redeveloping and hosting websites of DC(handlooms), DC(handicrafts) on the NIC server, private organizations can provide assistance by marketing these websites and thus expand the market access of the weavers
- Under government schemes like Technology Up-gradation Funds (TUFs), SMEs within NER and private players outside NER and within ASEAN economies can look forward to set-up medium to large scale industries in this region. Investors can also get access to all information through the Make in India portal launched by DIPP where investor queries are also answered
- Focus on marketing the products online and increase the reach of national and international road fairs where produce can be displayed to purchasers as well as investors
- Increase employment and entrepreneurship in particular for youth and women as well as encouraging knowledge-sharing across the textile and garment industry
- Increasing access to markets and increase trade-flows with mainland India and neighboring countries

Creating an attractive and competitive market will not only provide long-term benefits to the population but can also contribute to increased social and economic growth A potential area for growth would be to create a common brand for all textile products produced in the North-East Region including handicraft, handloom and art and craft items.

38. Ministry of textile Annual Report, 2014-2015.

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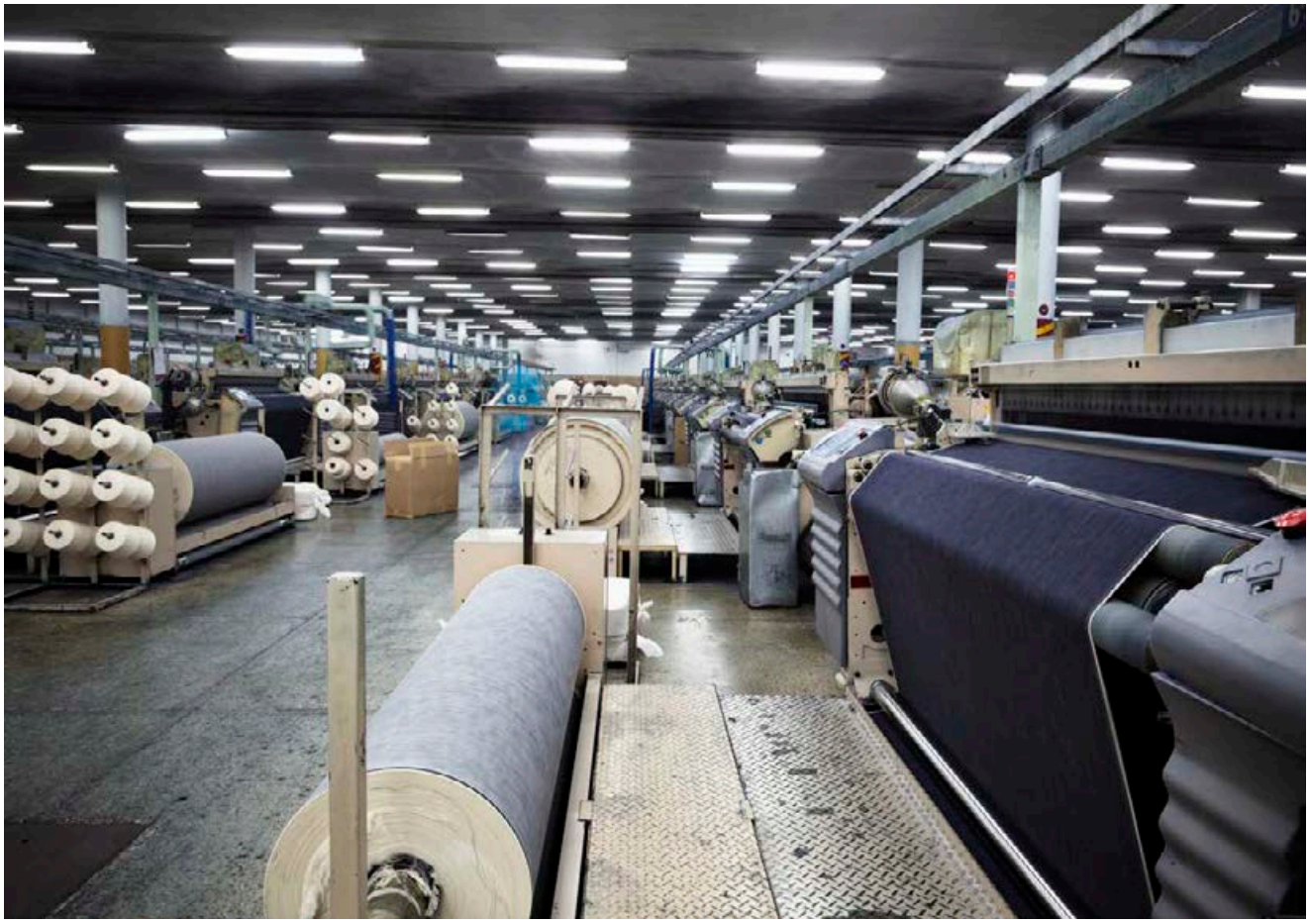
Infrastructure and Technology development schemes in North Eastern India

Some of the initiatives that have already taken place for promotion of textiles in the North-East:-

Scheme	Action
Sabke Sath Sabka Vikas	54 women sericulturists from all over India were felicitated for the first time in one day conference on 'Women Empowerment through Sericulture' held in New Delhi on the 17 September, 2014
Centers for production of garment and apparels in each North Eastern State	The M/O Textiles has given special attention for development of the North Eastern region in general and for the generation of productive employment for the youth and women in particular
Buyer seller meet	An exclusive buyer seller meet for promotion of handloom and handicraft products of North-East was held in Guwahati on 20 December 2014



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Handloom industry

Across the North Eastern states, the unorganized sector is relatively distributed, with each state holding significant comparative advantage in handloom, handicrafts and/or sericulture. The sericulture segment plays an important role in the economy of the NER particularly in the States of Assam, Manipur and Mizoram. Silk weaving takes place in only a small number of countries in which the North-East Region, predominantly Assam, attributes a high priority to silk production. In 2009-10, Assam produced 174 million meters of handloom fabric. However, it has been acknowledged that the State requires a number of skill up-gradation programmes to increase the number of trained qualified weavers[39].

Handloom weaving is part of the culture across different social groups. As per the 2009-10 Handloom Consensus, the number of Handlooms and Handloom Weavers in each of the States are as follows.

2009-10 Handloom Consensus of North Eastern States

State	Number of Handlooms	Number of Handloom Weavers/Workers
Arunachal Pradesh	27,286	33,041
Assam	1,111,577	1,643,453
Manipur	190,634	218,753
Meghalaya	8,348	12,925
Mizoram	24,136	43,528
Nagaland	47,688	65,303
Sikkim	345	568
Tripura	139,011	137,177

Source: Ministry of Textiles, Government of India, 2016. 'Fact Sheet, June 2016'. Available online at: < http://handlooms.nic.in/Default.aspx?ReturnUrl=%2f> [Accessed: July 2016]

Government Schemes

Source: Ministry of Textiles, Government of India, 2016. 'Fact Sheet, June 2016'. Available online at: < http://handlooms.nic.in/Default.aspx?ReturnUrl=%2f> [Accessed: July 2016]

Details of Block Level Clusters that have been sanctioned for the NER and the amount of funds released are outlined (as per December 2015)

Details of Block Level Clusters sanctioned for the North Eastern States

Name of State	No. of Block Level Clusters sanctioned	Amount Released (Rs. in Lakh)
Arunachal Pradesh	2	97.680
Nagaland	3	199.905
Manipur	4	241.812
Meghalaya	3	180.632
Mizoram	7	447.071
Sikkim	1	39.310

Source: Government of India, Ministry of Textiles, December 2015. Available online at: < http://handlooms.nic.in/writereaddata/2486.pdf> [Accessed: July 2016

39. Press Information Bureau, Government of India, Ministry of Textiles, 2013. 'Development of Textile Industry in North-Eastern States'. Available online at: <http://pib.nic.in/newsite/PrintRelease.aspx?relid=95786>[Accessed: July 2016]

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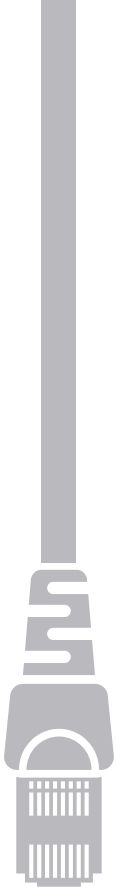

ERP Case Study - Leveraging ICT

In line with the 'Digital India' Initiative, government of India have proposed an Enterprise Resource Planning (ERP) system to be implemented to support commercial handloom activities and handloom weavers. The first module of the ERP system has been initiated in Varanasi and in January of 2016, The Union Textiles Minister launched the system in Coimbatore, the South Indian State of Tamil Nadu[40]. Several potential benefits are proposed to arise from the system including improved productivity and efficiency and decreased costs.

In the case of the NER, introducing such a solution could help the industry develop in many ways and enable higher volumes of goods to be exported. For example, several of the potential benefits that the NER could accrue include:

- An environment which would attract investments and enable local entrepreneurs to modernize and encourage growth in the textile industry
- Weavers could access information on their mobile in real-time
- ERP system can be developed in local languages to empower all users
- Weavers could track the dispatch of products

Growth Drivers – Key Opportunities

In line with the 'Digital India' Initiative, Business opportunities are rife for example processing industries (such as for fabric) can be set-up on a large scale for both natural and synthetic textiles. Manufacturing goods can be promoted in the national and international market and the region can market products using E-Commerce platforms instead of relying on middle-men to sell produce. With supporting infrastructure to store and transport goods, widespread availability of ICT and cooperation across states within NER and to mainland India, there are high development prospects for the textile industry.

Across much of India, the manufacturing sector has seen considerable growth. The Indian logistics market is set to grow at a CARG of 12.2% by 2020[41]. The increase in availability of 3G and 4G across India makes a solid foundation for such growth which can also, once in place, contribute to the development of the NER industry, logistics and manufacturing sectors.

The NER can leverage the increased connectivity through 'Brand-building' initiatives as well as increasing awareness and publicity of handloom products. Web portals can be further developed which promote the products of each State and fairs and exhibitions can be organized.

An environment which would attract investments and enable local entrepreneurs to modernize and encourage growth in the textile industry

- Effective marketing schemes to create awareness of the NER as a market supplying unique handloom products internationally
- Financial assistance must be provided by the government of India as well as state governments to promote the Textile industry and modernization efforts where possible
- Empower local weavers/artisans to create more complex, modern and diversified designs for example through Computer Aided Design (CAD) centers
- IT Capacity building through increased number of Self-help Groups (SHG's)
- Through digital platforms, the NER can tap E-commerce opportunities, supplying to mainland India and neighbouring countries
- Need a supportive business environment including efficient trading and customs regulations
- Products must be diversified and flexible to accommodate to the changing needs of the industry
- Participation in international exhibitions and fairs to publicize NER products for which such events can be advertised online.

40. Press Information Bureau, Government of India, Ministry of Textiles, 2015. 'Textiles Minister Launches ERP system of NHDC'. Available online at: <http://pib.nic.in/newsite/PrintRelease.aspx?relid=133630> [Accessed: July 2016]
41. Corporate Catalyst India, 2015. 'Industries & Sectors'. Available online at: <http://www.cci.in/p/industries> [Accessed: June 2016]

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Handicraft industry

The Handicrafts Sector plays a significant role in the economy of the North-East by providing employment to a vast segment of craft personnel. However the sector suffers several handicaps on account of its unorganised nature with the additional constraints of lack of education, low capital, poor exposure to new technologies, absence of market intelligence and a poor institutional framework. Some of the important crafts of this region are Cane and Bamboo, Mat weaving, Basketry, Wood work, Carpet weaving, Brass craft, Hand-block printing, Jewellery, Stone work, Jute handicrafts, Conch shell, Date leaf etc. Though handicrafts of North-East are gaining in popularity they have not been able to penetrate the high end of the domestic markets and the international markets. As a result, the exports from this region are very insignificant. The major challenge faced by the sector is that of marketing opportunities and scale.

Government Schemes

During the 2014-15, the government of India implemented seven different generic schemes for the development of handicrafts in NER. Brief highlights of the schemes are as under:

Schemes	Action	Commercial Interests
Baba Saheb Ambedkar Hastshilp Vikas Yojana	Develop artisans' clusters and includes initiatives like carrying out of base line Surveys, holding Design Workshops Shilpguru Awards, Distribution of Tool/Kits Marketing etc.	Private players, NGOs and potential employers can be facilitators and funders to such initiatives in order to increase the scale of the clusters
Government Fund disbursement	During the year 2014-15 Rs. 500.00 lakhs have been allocated for North Eastern Region under Marketing & Support Services Scheme (MSS)	New initiatives can come to the forefront for example opening of new outlets abroad, linking textile with tourism, e-marketing, capacity expansion etc.
Human Resource Development	Provide qualified and trained workforce for establishing a strong production base coupled with improvement in quality and use of appropriate techniques, processes and innovative designs to meet present day market requirement	Investment in these trained workforce can be a potential area of opportunity for the cloth and fashion industry not only in India but also in areas outside India
Research and Development	In-depth analysis to generate useful inputs to aid policy planning	PPP models can be developed to execute initiatives once relevant policies come to the fore

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Sports industry

Across the North-East Region, the sports industry is growing at a vast pace, becoming a focal area of interest and community exercise, engaging all age groups. Football, one of the main global sports industries, is an activity that can not only provide entertainment but also employment, skill development, investment and livelihood opportunities. Although in the past, the sporting industry was unable to expand due to a lack of infrastructure, the NER has experienced rapid development with the construction of new stadiums.

The stadiums have provided space for new ideas as well as opportunities for developing this sector further. An increased focus on producing academies and skilled coaches is essential.

Creating a thriving sporting industry can also help promote tourism, attracting national and international tourists to the Region. Other benefits in the value-chain include the development of surrounding urban infrastructure including transport routes for access into the NER as well as hospitality hubs. The economy will expand and encourage more entertainment industry sectors to look to the NER to tap the growth potential.

There are a number of areas which would require development and investment in order to promote the NER as a sporting hub. These could include:

- Creating small-medium sized sporting centers and enhancing surrounding infrastructure through PPP partnerships
- Playing fields must be used for sporting activities and the issues regarding alternative use of these areas must be addressed[42]
- Academies set up which promote development of sports and equip youth with the necessary skill-set
- Specialist skill development institutes for sports which use the talents of the local youth
- Coaching centers can be established which produce high quality sports coaches – trained coaches will work to encourage youth to participate in sports and develop their skills.

The media can play an important role in enhancing the sports industry in North-East India. The increased participation of North Eastern teams in league matches has been broadcast on a regional scale.

Given the opportunities that are available for the sports industry to grow, there are several ways in which ICT can be leveraged to support development, including:

- Marketing the NER football industry through TV advertisements and digital platforms such as social media, North-East websites and tourism sites
- Online portals can be developed which encourage visitors from outside of the region to stay and visit for example, homestays can be marketed on portals
- Football merchandise to be produced and then exported from NER to the mainland via online platforms and sites.

Sectors	Technical opportunities	Commercial Interests
Traditional and social Media Industry	Opportunity to develop platforms for broadcasting the growing popularity of football. With the recently concluded Federation Cup, all eyes are on this arena.	Potential Investors can cash on in this popularity through marketing, developing e-portals to give real time updates of the game to neighboring economies
Tech startups	Mobile applications can be a juicy area to let football fans connect with the players. They can also let these fans follow specific sports regime as publicized by the football players	Investors and VCs can look forward to invest in such startups thus giving the game much more popularity to the world outside
Marketing companies	Developing products based on growing football popularity. Product placement is also a big opportunity.	Private players in retail industry get the opportunity to promote their products and creation of brand awareness among football fans. Additionally upcoming football players can be invited to promote sports wear, gadgets etc.

42. The North-East Today News, 2015. 'NEDA political enclave kicks off with prime focus on development'. Available online at: < http://thenortheasttoday.com/neda-political-conclave-kicks-off-with-prime-focus-on-development/> [Accessed: May 2016]

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Tourism

The exotic picturesque region of North-East India, due to its several shortcomings of lack of infrastructure and connectivity bottlenecks, and its potential as a tourist hub has not yet been realized. The entire region is subject to the notion of geographical isolation by the tourists because of the lack of connectivity links, in spite of the region being a melting pot of culture and scenic spots. The region is equipped to entertain various kinds of tourism such as eco-tourism, golf and tea-tourism, heritage tourism, adventure sports-tourism and ethno-tourism among others.

After addressing the various tailbacks, the tourism industry can become a major revenue-generating source for the region. The development of the industry is likely to have multiplier effect benefits to the local communities triggering economic advancement. The infrastructural base that is required to be developed for a flourishing tourism industry-transport, communication links, health & sanitation, security check posts-will also benefit the local communities fuelling the overall development of the region.

Areas	Action
Technology upgrade	Image augmentation, infrastructure up-gradation and administrative and security trepidations need to be resolved for tourism to flourish and make a substantial contribution to the GDP of the Region
A single North-East tourism market for tourists	An integrated North Eastern Region Plan for tourism will help in the successful implementation of the vision. The seven sister states must be promoted as a single unit, reducing interstate competition for tourism.
Digital platform to connect with tourists and promote North Eastern India as a unified tourist destination	The North Eastern governments need to consolidate the industry by making available information to the tourists through websites, and tour operators to ease the travel planning for potential tourists to the NER

Government Schemes

In recent years, a significant push has been given to promoting tourism in the North-East Region. Financial assistance from the Ministry of Tourism, government of India is being provided to various NER states to undertake developmental projects. Tourism has grown significantly benefitting from the 4-lane highway[43]

43. Ministry of Road Transport and Highways, Government of India, 2016. 'Roads and Highways'. Available online at: < http://www.morth.nic.in/showfile.asp?lid=1624> [Accessed: June 2016]

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Healthcare

The healthcare sector in the North-East Region, as with much of India, is an area which requires considerable focus to increase the delivery of healthcare services. Due to poor infrastructure, limited resources and the lack of trained manpower, the NER has lagged behind significantly. Rural and remote areas in particular have suffered, facing challenges such as a lack of doctors, forcing patients to travel to far away locations. Primary Healthcare Centers (PHC's) are understaffed and are unable to provide quality services to the population at large.

Adding to the healthcare and doctor-population ratio problem, there is a severe shortage of medical colleges across the North Eastern States. Increasing the number of medical colleges would help to improve the doctor-population ratio as well as access to healthcare services for those in even remote areas.

Improvements in the healthcare sector would have a significant impact on the livelihoods and standard of living for much of the population in the NER. Applying ICT to health services will increase the efficiency of healthcare delivery. There are several areas which can leverage improved ICT and digital technologies including:

Areas	Recommended actions
Digitization of patient records	Electronic health records to be duly kept across the NER for a patient-centered approach to service delivery
Digital Payment platforms	Digital payment platforms could enable patients to pay for health services
Leverage ICT in connecting with patients and doctors	• Health center details can be shared on online sites to help guide patients • Health-related alerts and notifications can be sent via SMS to patients
Medical tourism	The Region could become a destination for medical treatment
Last Mile Connectivity	Through digital platforms, people in remote locations could access health services e.g. through sending medical images or participating in medical forums between Healthcare providers and patients

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Education

Skill development and education are integral areas for development, particularly across the NER. Although the number of educational institutions at both secondary and higher-secondary level has increased in recent years, the number of technical colleges is severely lacking. Of all regions in India, the North-East Region in particular requires an increased focus on skill development as a way of generating rural employment.

Education is a sector which can effectively leverage ICT for example through ICT-based learning and teaching through the use of ICT.

Imparting IT education arguably has a number of benefits including improving the quality of education delivery and reducing drop-out rates. There are a number of initiatives that should be taken up by the North-East including:

Areas	Recommended actions
Digital Education Fund	Create a North-East technical education fund to enable the fast-paced development of technical institutions
Connected education institutions	Education institutions must have broadband internet access to ensure students can stay connected to the internet, staying engaged and informed
Leverage ICT in educating young talent	• Encourage students to stay engaged and informed • ICT can enable children to learn in the language they choose through translation services online • Training can be provided to teachers through ICT which will encourage the use of ICT in schools. This could arguably increase the quality of schooling in the NER • ICT-based camps in the NER can encourage children to use ICT creatively and become aware of the opportunities they have within the 'growing' ICT industry of the NER

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Food processing

Although the North-East Region is abundant in natural resources and many of the States have geo-climatic conditions which are favourable to the growth of fruits, vegetables and spices, the food processing industry's development has been slow. Developing Food Processing parks as well as industry specific infrastructure will help to increase the export potential of North Eastern India.

Areas	Technical opportunities	Commercial Interests
Infrastructure	• Streamlining of the traditional industrialized supply chain through the application of sensors and the creation of more integrated business processes • Creation of new forms of supply chains that augment food products through data and new technologies • Creation of reliable, secure, robust and economically sustainable 'short' supply chains. These short supply chains allow the re-territorialization of parts of the food system into local areas	Investments in construction of food, supply chain management, farm management and food management.
Human Resources	Human resources to develop, manage and execute such systems is a critical factor in the successful digitization of the food processing sector in the North-East and ASEAN economies. While the North-East has the raw materials which serves as an input to the industry, with supply of such talent, the Region could have the potential to develop a food processing industry.	Skilled people from the North-East providing assistance to run the digital platforms for the food processing industries in ASEAN economies
Policy	A collaborative effort from government to implement dedicated food processing sector policy which can provide wide range of incentives such as capital grant for mega food parks, interest subsidy, power subsidy etc.	There is a vast untapped potential for the food processing industry. Some of the opportunities include :- • Apple cultivation and processing • Processing of citrus fruits • Multipurpose fruit and vegetable processing

The eight states of the North East, including Sikkim, can contribute in their own way to develop the food processing industry.

Arunachal Pradesh

In Arunachal Pradesh, where agriculture and horticulture is the largest employer[44] , a focus has been put on the cultivation of cash crops including potatoes and sugarcane. There is huge opportunity for growth of the food processing industry in this state as it requires low investment but will generate significant employment[45].

Assam

The State of Assam is the largest producer of tea in the North-East Region, contributing about 55 percent of tea produced in India[46]. In 2011, the estimated production of tea was 508.7 thousand tonnes[47]. Aside from this, the region is also emerging as a destination for food processing. With the assistance of the Ministry of Food Processing Industries (MoFPI), six pineapple and orange processing units have been established as well as a Mega Food Park which has been operationalized at Nablari, Assam[48]. The development of these will give a boost to the food processing sector and help to promote the region to potential investors. Although these developments are noteworthy, similar achievements should be encouraged in other North Eastern States which promote entrepreneurship and create employment.

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44. Department of Horticulture, Government of Arunachal Pradesh. 2016. Available online at: < http://arunachalpradesh.gov.in/dhorti.htm> [Accessed: July 2016]
45. Ministry of Development of North Eastern Region (MDONER), 2015. Available online at: <http://mdoner.gov.in/sites/default/files/silo4_content/Investment%20opportunities/CII/final.swf> [Accessed: June 2016]
46. Ministry of Development of North Eastern Region (MDONER), 2015. Available online at: < http://mdoner.gov.in/sites/default/files/silo4_content/Investment%20opportunities/CII/final.swf> [Accessed: June 2016]
47. Investors Portal of Ministry of Food Processing Industries (MoFPI), 2016. Available online at: < http://foodprocessingindia.co.in/status-of-assam-s-food-processing-industry-assam.html. [Accessed: June 2016]
48. Investors Portal of Ministry of Food Processing Industries (MoFPI), 2016. Available online at: < http://foodprocessingindia.co.in/status-of-assam-s-food-processing-industry-assam.html> [Accessed: June 2016]

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Manipur

With fertile soil and suitable agro-climatic conditions, the state of Manipur is a large producer of fruits, vegetables and cash and food crops. The region has great potential for large scale plantation of crops as well as development of the food processing sector. Bamboo shoots and ginger in particular attract a wide market outside of the State and can be a focal point for attracting investment into this sector. Entrepreneurs and artisans must be made aware of the development opportunities and should be supported by central and state governments in growing and enhancing the industry.

Mizoram

The State of Mizoram borders two neighbouring countries: Bangladesh to the West and Myanmar on the East. In sharing an international boundary with these two countries, Mizoram offers great potential for developing bilateral trade. There exists numerous investment opportunities which include agro-horticulture development, bamboo and information technology[51].

Contributing 14 percent of the all India bamboo distribution[52], Mizoram has the opportunity to develop industrial units to create bamboo products on a larger scale. Industrial units could be set up to increase exports of bamboo-based products, attracting local entrepreneurs and PPP initiatives.

Meghalaya

The State of Meghalaya is in an advantageous position, rich in natural resources such as coal and uranium. A large number of horticultural crops are grown in the region including mushroom, spices and fruits including oranges, pineapples, peaches, guavas and bananas[49]. Production details of fruits and vegetables are provided below:

Crop	Horticultural Crops ('000 MT)		
	2011-12	2012-13	2013-14
Fruits	294.8	241.9	515.69
Vegetables	415.8	356.5	403.78

Source: Investors Portal of Ministry of Food Processing Industries (MoFPI), 2016. Available online at: < http://foodprocessingindia.co.in/production-base-resource-mapping-meghalaya.html> [Accessed: June 2016]

Bamboo also plays an integral role in the economy of Meghalaya and with the support of technology and trade development, can be converted in to a number of products including bamboo-ply, mat-board, structural building, incense sticks, handicrafts and furniture, agricultural implements, bamboo houses and many others[50]. To realise the region's potential, the state government must work to establish bamboo-based industries and encourage the participation of local entrepreneurs.

Moreover, development of the food processing industry has been slow and according to the Meghalaya State Development Report of 2008-09, 12 medium and large scale units are engaged in food and food processing activities. The Ministry of Food Processing Industries has not yet sanctioned a mega food park for the state or similar food processing infrastructure. However, if implemented, this would offer an opportunity for the food processing industry to flourish as well as encouraging SME and PPP investments.

A cluster based-development model can be developed which can boost agro-horticultural growth for example:

- There is potential to grow horticultural crops such as strawberries, turmeric and agar along the border of Bangladesh and in the Garo Hills

Nagaland

Nagaland is rich in bio-diversity with a favourable climate for growing medicinal and aromatic plants. Recognizing the opportunity to expand the bamboo industry, the Nagaland Bamboo Resource Centre, located at Dimapur, has been set up by the Nagaland Bamboo Development Agency (NBDA)[53]. The facilities at the center are being fully utilized whilst entrepreneurs are encouraged to learn production techniques and market their bamboo-based products[54].

Although there have been some developments in the bamboo and food processing sectors, it is evident that more opportunities for development exist.

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49. Ministry of Development of North East Region (MDONER), 2015. Available online at: <http://mdoner.gov.in/sites/default/files/silo4_content/Investment%20opportunities/CII/final.swf> [Accessed: June 2016]
50. Meghalaya Basin Development Authority, n.d. 'Bamboo Plantation Programme'. Available online at: < https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=0ahUKEwjN6sa1mITOAhVYImMKHSHaBWcQFggtMAM&url=http%3A%2F%2Fmbda.gov.in%2FPDFs%2FBamboo%2520Plantation.pdf&usg=AFQjCNGAg0zAlSt0baFJPmehloQtrsU1dQ&bvm=bv.127521224,d.cGc> [Accessed: June 2016].
51. Ministry of Development of North East Region (MDONER), 2015. 'Mizoram at a Glance'. Available at: < http://mdoner.gov.in/sites/default/files/silo4_content/Investment%20opportunities/CII/final.swf> [Accessed: May 2016]
52. Ministry of Development of North East Region (MDONER), 2015. 'Mizoram at a Glance'. Available at: < http://mdoner.gov.in/sites/default/files/silo4_content/Investment%20opportunities/CII/final.swf> [Accessed: May 2016]
53. Nagaland Bamboo Development Agency (NBDA), 2012. Available online at: < http://nagalandbamboo.com/about-us.php> [Accessed: July 2016]
54. Nagaland Bamboo Development Agency, 2012. Available online at: < http://nagalandbamboo.com/about-us.php> [Accessed: June 2016]

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Sikkim

With a suitable climate, agriculture and horticulture flourish in Sikkim. Multiple fruit and vegetable crops are grown in the State including barley, pea, soya bean, potato, orange, banana and passion fruit. Despite this, there are very few large processing units within Sikkim and only three have a Food Process Order (FPO) license[55]. Based on the availability of raw materials in the state, there is an opportunity to expand on the number of processing units and increase the sales revenue of the food processing industry. Particularly, medicinal plants and bamboo should be priority sectors for investment.

Tripura

Among the North Eastern States, the state government of Tripura has made a considerable effort to increase the opportunities for food processing and associated industries, encouraging the development of bamboo and rubber industries. Interested entrepreneurs are encouraged to set up business operations within the Park, with a large emphasis being placed on tapping the export potential to the neighbouring countries of Bangladesh, Myanmar and further afield to Vietnam, Philippines and ASEAN members[56].

- There is also potential to ship rubber raw materials, produced in Tripura, to Kolkata via the Akhaura Port in Bangladesh. This will give India and particularly the NER, a competitive advantage over the Rubber industry in Malaysia.

Disaster Risk Management

Geographically located close to the Himalayan region, North Eastern India is prone to natural hazards such as earthquakes, landslides and floods. Floods are a recurring annual feature of Assam when the Brahmaputra and its tributaries, with very large catchments, are flooded exceeding the banks limit, submerging a substantial part of Brahmaputra plain. Being risk ready and getting real time updates of global environmental changes is the foremost priority to prohibit disasters caused by these natural calamities.

Some of the ways by which ICT development can create a robust disaster risk management system and bring substantial business opportunities to the region are mentioned below :-

Areas	Technical opportunities	Commercial Interests
GIS implementation	Building a robust and resilient Geographic Information System (GIS) which provides the most versatile platform for Decision Support by furnishing multilayer geo-referenced information which includes hazard zoning, incident mapping, natural resources and critical infrastructure at risk, available resources for response, real time satellite imagery, etc.	Investors have huge opportunities to invest in the resources and the critical infrastructure required to develop such responsive systems. This can be done in collaboration with the state and the central governments.
Online inventory	A comprehensive database of disaster management related inventory from district to state level is critical	Investments by private and public players on skilled manpower to create such an online database with real time data feed into the system
ICT infrastructure	Remote Sensing and Satellite based communication links provide early warning signals. ICT tools along with data warehousing techniques can build knowledge warehouses which can facilitate planning & policy decisions for preparedness, response, recovery and mitigation at all levels.	For successful planning and implementation, ICT technologies are indispensable. Thus sourcing of quality equipment is a major investment which cannot be compromised. Private organizations and SMEs should come forward to the major suppliers.

55. Investors Portal of MOFPI, 2016. 'Status of Sikkim's Food Processing Industry'. Available online at: < http://foodprocessingindia.co.in/status-of-sikkim-s-food-processing-industry-sikkim.html> [Accessed: June 2016]
56. Ministry of Development of North East Region (MDONER), 2015. Available online at: <http://mdoner.gov.in/sites/default/files/silo4_content/Investment%20opportunities/CII/final.swf> [Accessed: June 2016]

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Connectivity with neighbouring countries

Chelyabinsk
Omsk
Astana
Barnaul
Karaganda
Baykonyr
KAZAKHSTAN
Kazakh Hlds.
Altai Mts.
Balkhash
Dzungaria Basin
Tashkent
Bishkek
Almaty
UZBEKISTAN
KYRGYZ
Samarkand
Dushanbe
Kashi
Ürümqi
TAJIKISTAN
Tarim Basin
Kabul
Islamabad
Kunlun Shan
AFGHANISTAN
Tibet Plat.
Lahore
Himalaya Ra.
PAKISTAN
NEPAL
Lhasa
Karachi
Agra
INDIA
Yeniseysk
Novokuzn
Altai Mts.
Dzungaria Basin
Tarim Basin
Kunlun Shan
Tibet Plat.
Himalaya Ra.
Lhasa
Ürümqi
Almaty
Barnaul
Omsk
Chelyabinsk
Astana
Karaganda
Baykonyr
Tashkent
Bishkek
Samarkand
Dushanbe
Kashi
Kabul
Islamabad
Lahore
Karachi
Agra
Patna
Kolkata
Dhaka
NEPAL
INDIA
PAKISTAN
AFGHANISTAN
UZBEKISTAN
KYRGYZ
TAJIKISTAN
KAZAKHSTAN
Kazakh Hlds.
Balkhash

The strategic location and immense growth potential of North Eastern India is the cornerstone for promoting increased regional integration with India's neighboring countries including Bangladesh, Myanmar and other members of the ASEAN. In particular the North Eastern states share land borders with Bangladesh, Bhutan, Myanmar, Nepal and China, acting as a gateway to South East Asia and offering vast opportunities for inclusive growth through integration. The South East Asian region also provides several benefits to neighboring countries including India.

Since 1992, India has adopted several initiatives to enhance both economic and strategic ties. These include the Asia-Pacific Trade Agreement (APTA) which comprises of India, Sri Lanka, Bangladesh, Lao People's Democratic Republic and the Republic of Korea[57]. Most recently in August 2014, India introduced the 'Act East' Policy (AEP) which renewed the previous 'Look East' Policy (LEP). Such policies and Initiatives are critical in not only driving development within the North Eastern India but in promoting growth and integration across the countries that lie to the east of India.

Length of International Borders of the North-East Region with neighboring countries (in km)

North-East States	Bangladesh	Bhutan	Myanmar	Nepal	China	Total
Arunachal Pradesh	0	217	520	0	1080	1817
Assam	263	267	0	0	0	530
Manipur	0	0	398	0	0	398
Meghalaya	443	0	0	0	0	443
Mizoram	318	0	510	0	0	828
Nagaland	0	0	215	0	0	215
Sikkim	0	32	0	97.80	220.35	350.15
Tripura	856	0	0	0	0	856
Total	1880	516	1643	97.80	1300.35	-

Source: Government of India, Ministry of Development of North Eastern Region (MDONER). Available at: < http://mdoner.gov.in/node/202> [Accessed: May 2016]

Opportunity	Key Actions
Telecom and digital connectivity	Enhancing connectivity through communication networks and infrastructure development can facilitate increased engagements between the North-East Region and the ASEAN members. Particularly, better-quality telecom and digital connectivity is likely to generate multiple opportunities for enhancing cross-border trade, integrating e-services into the current landscape, setting up research and development programmes, creating a strong outsourcing industry and transforming the financial services landscape
Removing the trade barriers	Implementing institutional mechanisms and policies to allow the free flow of goods between North Eastern states and ASEAN economies
Efficient and competitive Logistics sector	• Remove all restrictions on trade in logistic services between regions • Expedite the liberalisation of the telecommunication services among North Eastern states of India and ASEAN economies

To effectively harness the region's full potential and increase mutual cooperation, it is essential to identify sectors which hold comparative advantage for both the North-East Region and the ASEAN countries. In this way, a sector focus for selected significant countries can encourage policy makers, government departments and officials as well as development organizations to target capacities for strengthening political, economic and social relations. Through a cluster development approach, regions will be able to take advantage of common infrastructure such as ICT infrastructure, to achieve increased economies of scale.

57. Indian Trade Portal, ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC, 2005. Available online at: < http://files.indiantradeportal.in/uploads/files/New%20Agreement/bangkok_agreement.2-36.pdf> [Accessed: June 2016]

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North Eastern India as a trade and commercial hub

Strategically located close to major emerging markets, the North-East has huge potential to become a trade and commercial hub, offering local and international investment opportunities and becoming a strong base for emerging businesses. Given the existing market conditions, the scope for improving production networks between these countries is large.

Bangladesh is a major trading partner for the North-East, despite a long and troubling history of political disputes, stemming in part from the uneasy bilateral trade relationship between the two countries. Cross-border trade between Bangladesh and the North-East Region has been steadily growing. Exports from the North Eastern India to Bangladesh are twice the size of its imports, however the NER has witnessed an increase in its imports from Bangladesh, particularly during 2008-09 and 2012-13. From 2008-2009 the NER exported INR4.2 billion to Bangladesh, and INR9.2 billion from 2012-2013.

Some of the areas in which North-East can forge into trade relationships with ASEAN economies:-

Resources	Opportunities
Food and Minerals	The NER exports several products to Bangladesh including coal, tea, limestone, diesel oil, cumin seed, and fresh ginger . Bangladesh on the other hand, exports products such as fish, betel nut, food items and mobile handsets
Limestone	Aside from this, a large proportion of cement from Bangladesh is directed to the NER , of which limestone is imported from the NER as an input for the cement
Cement	Private players in particular can prosper from this growing sector by setting up cement plants in the NER Investing in this industry and becoming a key producer of cement, the NER can further expand on current trade networks.
Hydro-power	Bestowed with huge hydro-power potential, the NER should focus on attaining the objectives set out in the 'North East Hydrocarbon Vision 2030' e.g. increasing the levels of energy supplied to Bangladesh. Here exists considerable scope for increased cooperation. In particular, the states of Arunachal Pradesh and Sikkim have untapped hydroelectric power potential. PPP partnership models can be developed here which encourage India and Bangladesh to work together towards the joint development of the energy sector in both Bangladesh and NER.

Agriculture, horticulture and natural resources

The North-East Region is abundant in natural resources including limestone, coal, petroleum crude, natural gas, dolomite, and uranium. The States of Assam and Meghalaya are the main producers of coal while Assam also holds substantial reserves of oil and natural gas.

Commercial horticulture, forest products, fruits and vegetables and hydro-energy potential also blesses the North-East Region. Each of the States are abundant in natural produce however the export potential is much more. The food processing sector in particular has seen considerable growth and presents a number of development opportunities to the NER. The State of Arunachal Pradesh in particular, given its topography and climate, is a prime location for expanding the food processing sector. This would involve the development of processing units as well as providing infrastructure for transportation of goods to facilitate trade.

ICT development in particular can facilitate in cross border trade for example technological innovations have made it easier for small firms to connect buyers with sellers and participate in international trade. This has in turn reduced trade costs and transaction costs. Traders within North Eastern states can similarly enter into a buyer seller relationship thus giving a boost to exports of agricultural produce and enter into new value chains.

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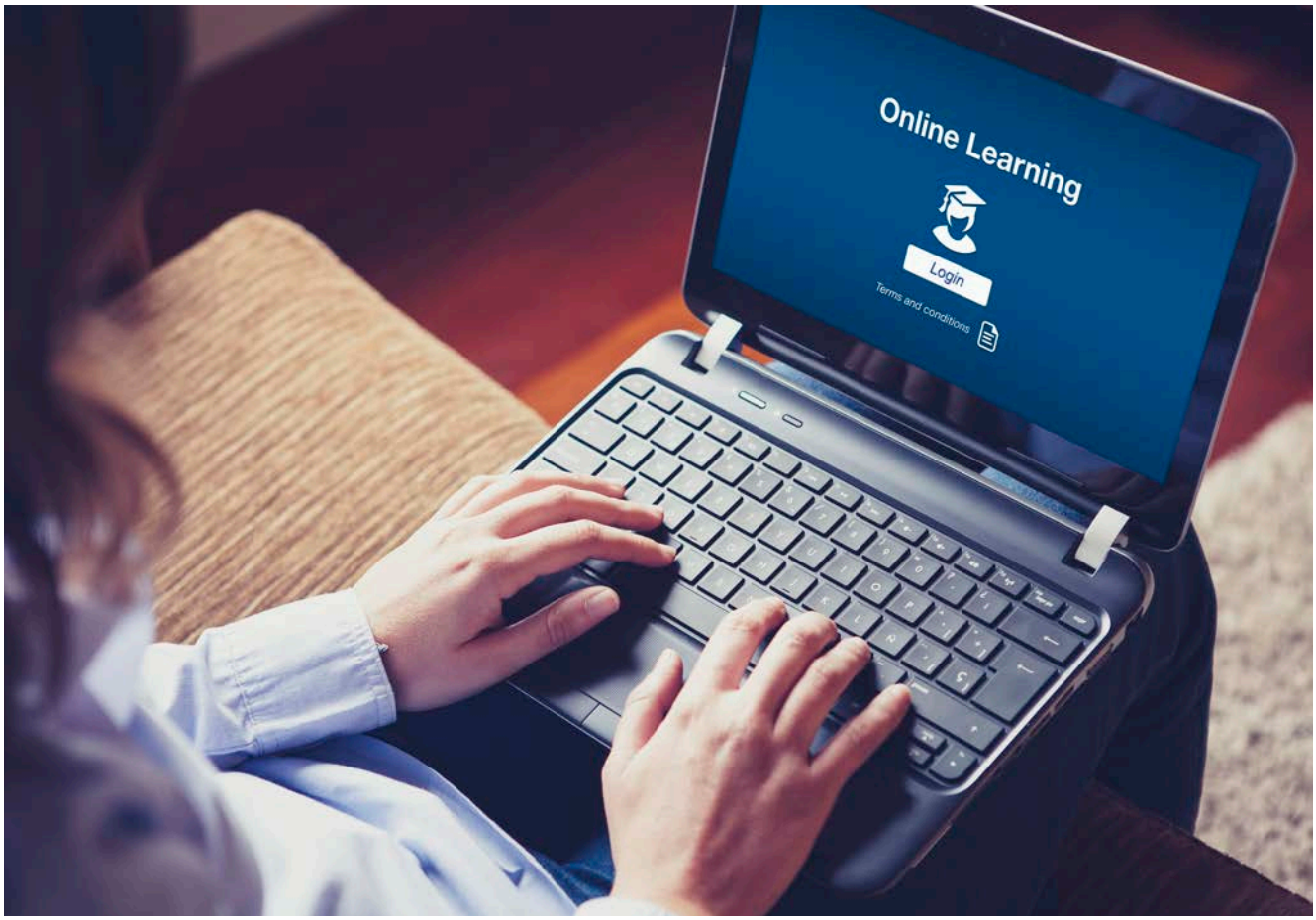
Education and healthcare benefits across the Regions

An improvement in education and healthcare services will have several potential benefits not only to the NER but also to neighbouring countries. An increased awareness and presence of ICT in schools in the NER, will not only increase the quality and reach of learning for the students of the North-East but will also become institutions for students in neighbouring countries to attend.

Resources	Opportunities
Education	Investment in management institutes can attract student talent from Bangladesh and ASEAN economies
Medical Tourism	High quality healthcare services can attract medical tourists to the NER although this must be supported by physical infrastructure. This can provide neighbouring countries with high quality services they can tap into
Research and Development	Increased cross-border cooperation will facilitate a greater focus on R&D as well as knowledge sharing

Source: OECD, WTO, 2015. 'Aid for Trade at a Glance 2015: Reducing Trade Costs for Inclusive, Sustainable Growth'. Available online at: < https://www.wto.org/english/res_e/booksp_e/aid4trade15_chap1_e.pdf> [Accessed: June 2016]



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Roadmap for development

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2016-2017
The starting point

2017-2018
Accelerate reform adoption

2019-2020
Aim to be a frontrunner and a national gateway for ASEAN economies

Policy Enablers

- Issue telecom licenses to raise coverage and introduce competition in the market
- Provide ROW permissions to telecom players and other potential employers looking for investment opportunities in the North-East.
- Introduce business-friendly policies to attract and encourage potential employers, investors and SMEs to build their organizations in the NER IT hubs, tech-parks, education zones etc.
- Encourage private bodies to build communities with hospitable environment and civic amenities
- Employ infrastructure policies to strengthen the road, rail and air connectivity in the North-East.
- Introduce checks and balances to deter corruption and malpractices.
- Develop data policies that offer anonymity and increase the availability of data sharing across ICT infrastructure
- Establish checks and balances to oversee the support and maintenance of ICT connectivity, transport connectivity and community structures built in the North-East

Community Mobilization

- Plan a community development roadmap to support future IT hubs in the region
- Plan the set-up of IT parks, high tech zones, food parks, ICT enabled educational institutions, universities, etc.
- Start with the basic foundation of building primary requirements in healthcare, entertainment and transport connecting planned IT hubs
- Set-up the basic foundation of digital North-East
- Encourage the set-up of management, medical, engineering institutions in the North-East.
- Build a robust community with advanced facilities of healthcare, entertainment, transport and telecom connectivity to make the livelihood of IT hubs in the North-East sustainable
- Develop a flourishing IT hub with BPOs, software teach parks attracting young skilled talent

Institutional Mechanisms

- Reduce tariffs and subsidies for consumer mobile connections
- Plan to set-up monitoring mechanisms for IT platforms and ICT implementation
- Establish a body to look over the construction of infrastructure required to achieve NE connectivity
- Divide the planning body into different departments which would take care of every aspect of infrastructure requirements. Bring on board private players for each of these departments
- Build a sound governing body for redressal of the grievances of potential investors
- Set-up a IT monitoring team to diligently follow the development of IT hubs.
- Set-up a progress meter to track the monthly progress of targets set by each and every department for infrastructure, community and digital connectivity development across the North-East.
- Recruit people for monitoring, implementation, and completion execution activity
- Functioning teams to review the completion of IT development projects
- Functioning teams to overlook into the maintenance and support of the developed community structures

Infrastructural mechanisms

- Identify important infrastructure requirements for enhancing digital connectivity
- Increase ICT investments in basic infrastructure such as optic fibres, DCs and satellite communication links
- Arrange for 24X7 power infrastructure availability to backup digital infrastructure.
- Plan for road connectivity and highways which would facilitate in expanding optic fibre network in the North-East.
- Once the basic ICT infrastructure is in place, plan for investments in advanced technologies such as 4G, FTH etc.
- Continue investing in DC capacity in order to extend coverage
- Launch initiatives for inspiring enterprises, governments, and consumers to adopt cloud services
- Connecting areas wirelessly across North Eastern India
- Continue investing in expanding broadband network and increase the broadband speed
- Embrace ultra-fast next gen networks with low latency to kick-start sunshine sectors like AI, robotics, M2M, big data etc.
- Invest in IoT initiatives

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Appendix

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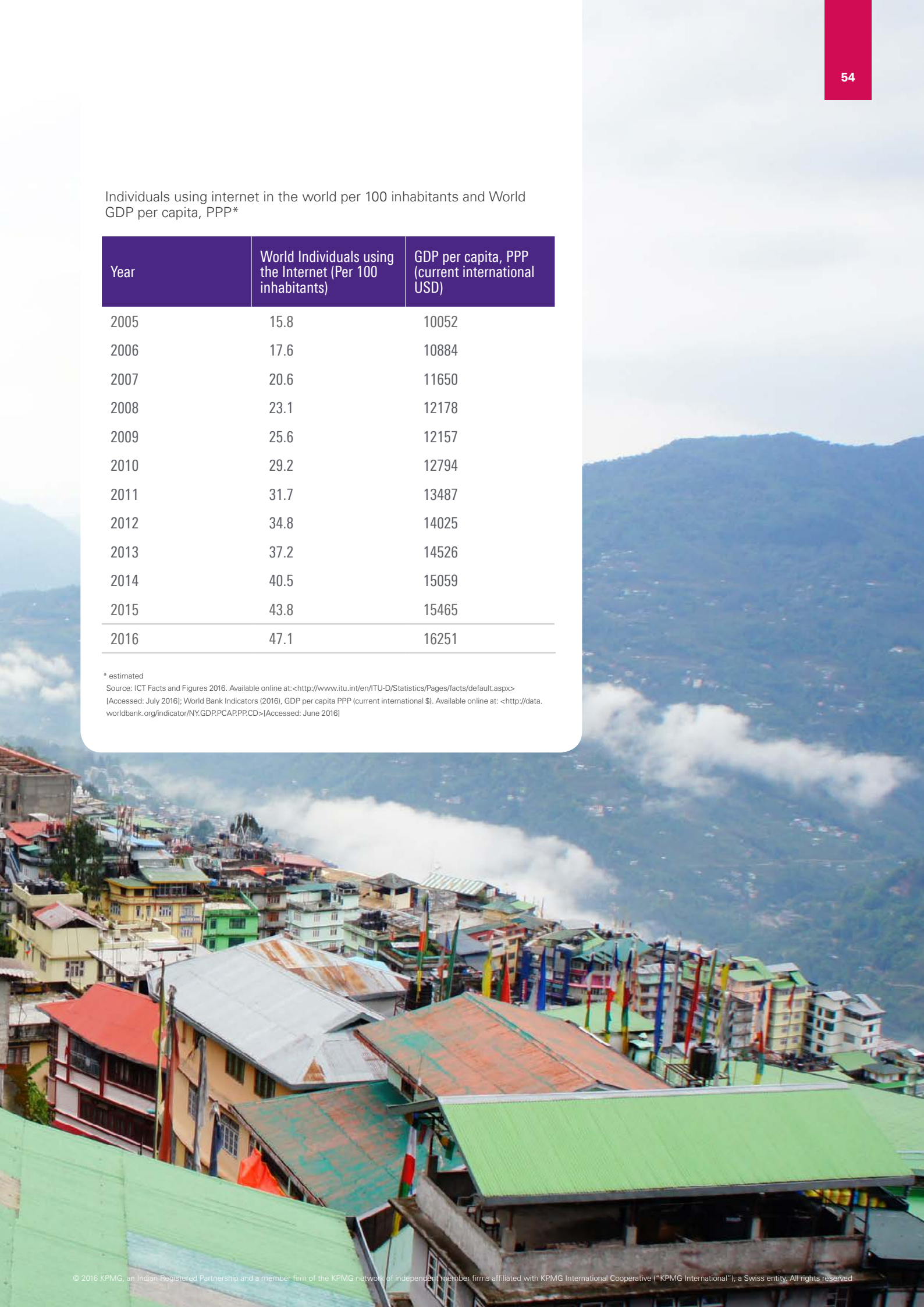
Individuals using internet in the world per 100 inhabitants and World GDP per capita, PPP*

Year	World Individuals using the Internet (Per 100 inhabitants)	GDP per capita, PPP (current international USD)
2005	15.8	10052
2006	17.6	10884
2007	20.6	11650
2008	23.1	12178
2009	25.6	12157
2010	29.2	12794
2011	31.7	13487
2012	34.8	14025
2013	37.2	14526
2014	40.5	15059
2015	43.8	15465
2016	47.1	16251

* estimated

Source: ICT Facts and Figures 2016. Available online at:<http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx> [Accessed: July 2016]; World Bank Indicators (2016), GDP per capita PPP (current international $). Available online at: <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>[Accessed: June 2016]



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We strive to provide rapid, performance-based, industry- focused and technology-enabled services, which reflect a shared knowledge of global and local industries and our experience of the Indian business environment.

KPMG International

KPMG is a global network of professional firms providing Audit, Tax and Advisory services. We operate in 155 countries and have more than 155,000 people working in member firms around the world.

The KPMG Audit practice endeavours to provide robust and risk based audit services that address member firms' clients' strategic priorities and business processes.

KPMG's Tax services are designed to reflect the unique needs and objectives of each client, whether firms are dealing with the tax aspects of a cross-border acquisition or developing and helping to implement a global transfer pricing strategy. In practical terms that means, KPMG firms work with their clients to assist them in achieving effective tax compliance and managing tax risks, while helping to control costs.

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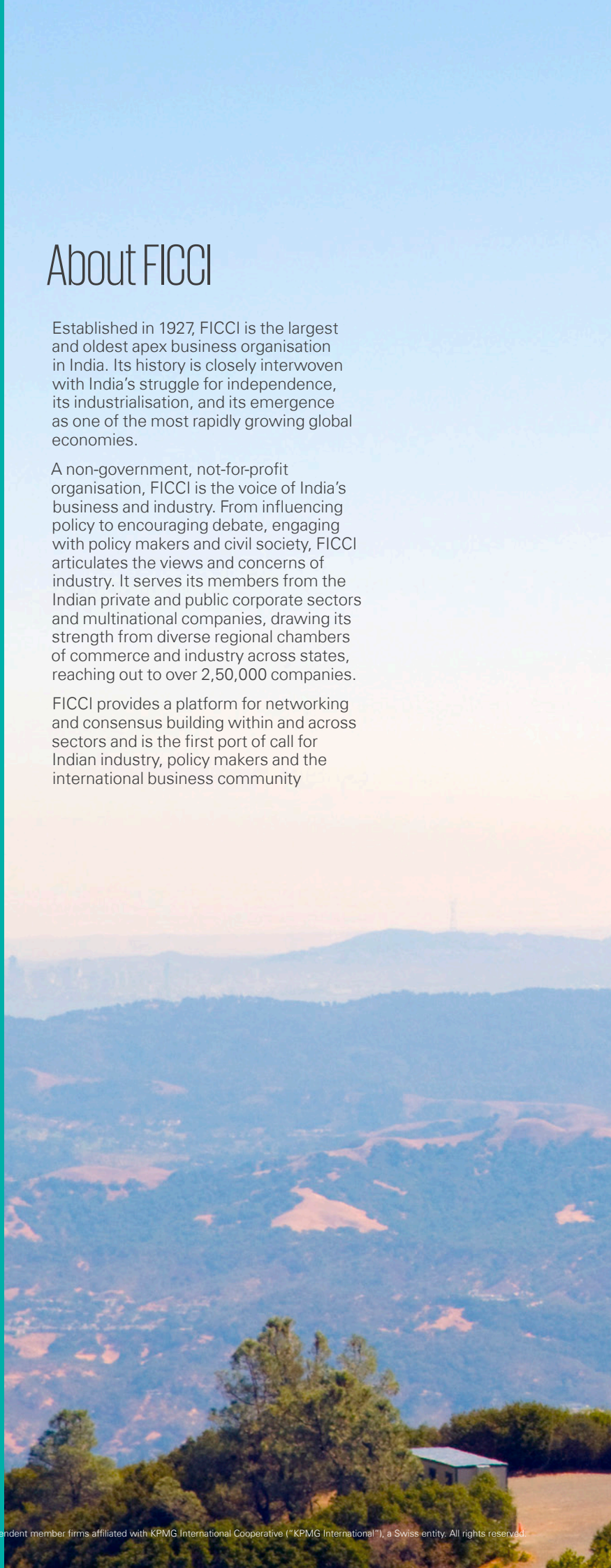
About FICCI

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialisation, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community



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