INTERNET INCLUSION:
Advancing Solutions

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Internet Inclusion: Advancing Solutions (IIAS)–India

Executive Summary

India has both the world's second-largest population of people *with* internet connectivity and the largest population of people *without* it. This paradox makes India a particularly appropriate setting for the IEEE Internet Initiative's *Internet Inclusion: Advancing Solutions (IIAS)* series of multi-stakeholder gatherings designed to progress toward the goal of connecting the world's unconnected.

At *IIAS-India* in New Delhi on 6 October 2017, stakeholders from across government, industry, non-governmental organizations (NGOs), and academia, among others, came together to examine internet inclusion from such perspectives as innovative business models and financing, public access and community networks, energy and connectivity, the gender divide, and digital literacy. *IIAS-India* began with a High Level Roundtable on Digital Inclusion and closed with a workshop designed to engage the IEEE Internet Initiative community on a country level and marshal event participants in coalescing around India's particular pain points and goals.

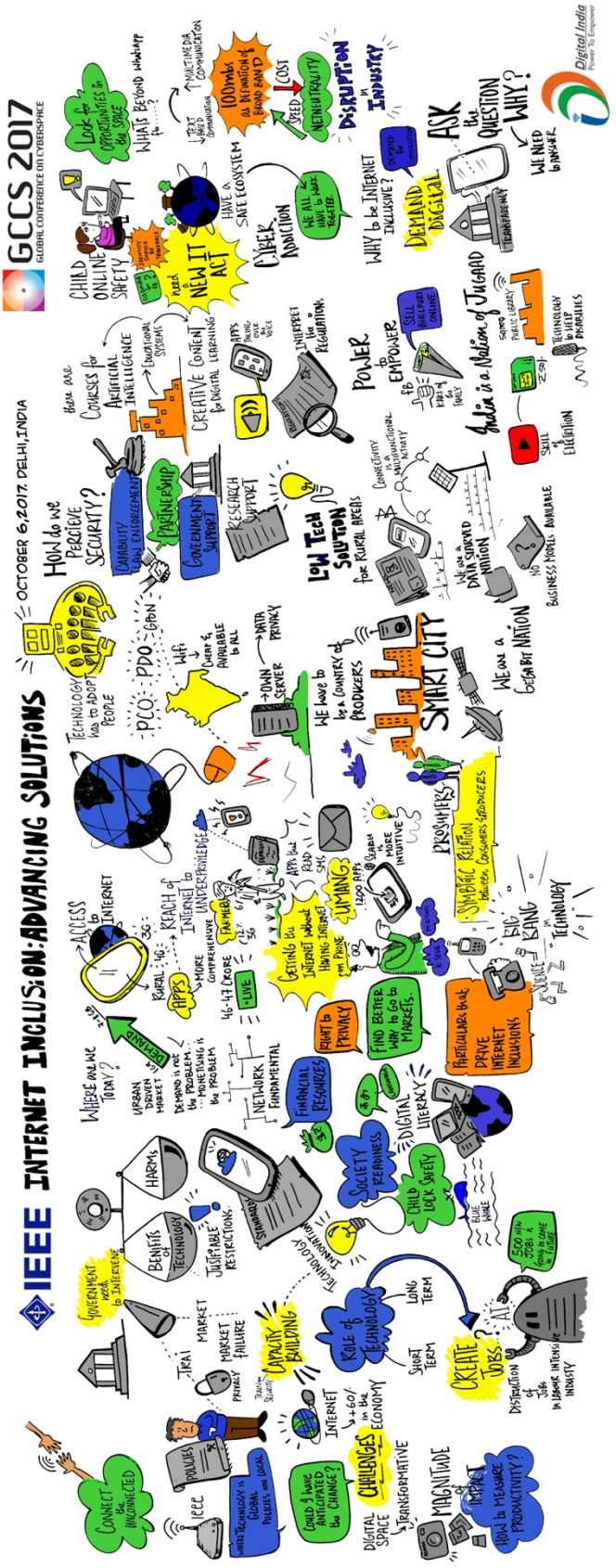
The roundtable session focused on the "Digital India" initiative, through which India has established itself as a global thought leader in addressing digital inclusion. A robust collection of related programs is serving to transform India into a fully digital-empowered society and knowledge economy, and there is much to be learned from India's efforts and shared through the IEEE Internet Initiative's global presence.

The *IIAS-India* workshop galvanized event participants in drawing on their collective expertise and experiences to detail the practical challenges and solutions for connecting the unconnected in India. Participants brainstormed barriers to inclusion and categorized them within "5 A's:" availability, affordability, accessibility, awareness, and assurance. Within context of these dimensions of lack of inclusion, participants considered consensus-driven outputs that are needed to advance ideas and hasten the development, adoption, and use of sustainable solutions.

Key Challenges and Solutions

Dimension	**Challenges**	**Solutions**
Availability	• Poor coordination among multiple stakeholders • Network operators do not see business model in some regions • Lack of reliable power and adequate backhaul infrastructure • Inadequate spectrum availability	• Increased collaboration • Rollout-friendly regulatory framework • Public/private/panchayat partnership in community networks • Refarming available spectrum to new users

Dimension	Challenges	Solutions
Affordability	• Relatively high cost (with respect to per-capita income) of: o Devices o Access services	• Low-cost devices and innovative financing • Rationalization of spectrum charges; unlicensed spectrum and TV white spaces
Accessibility	• Social barriers (gender, caste, age, disabilities, etc.) • Lack of apps and content in local languages	• Apps in local languages and with local context • Audio-visual content, Braille interfaces, etc.
Awareness	• Lack of digital literacy and understanding of internet's socio-economic potential • What partnership possibilities exist? • What incentives are needed?	• Raise awareness of internet's positive impact on socio-economic value (e.g., for job creation) • Multi-layered programs for digital literacy/skills and integration in school curricula • Engage panchayats • Village-level viability gap funding
Assurance	• Increasing cyber crime and data theft • Concerns on surveillance/monitoring • Inconsistency in service quality	• Legislative reform and effective enforcement; cyber literacy • Adoption of privacy by design, privacy by research, and standard data-protection principles



Background

The IEEE Internet Initiative promotes thought leadership and innovation and advances solutions for a trustworthy and inclusive internet by contributing technology expertise and resources to the policy ecosystem and providing a collaborative development platform and community to produce action-oriented and implementable outputs. Under the aegis of the IEEE Internet Initiative, several activities have been undertaken, including, but not limited to, events like the IEEE Experts in Technology and Policy (ETAP) Forums and *Internet Inclusion: Advancing Solutions (IIAS)* gatherings. In addition, white papers have been developed and webinars have been held.

The IEEE Internet Initiative hosted *Internet Inclusion: Advancing Solutions—India (IIAS-India)*[1], in New Delhi on 6 October 2017, as a run-up event to the Global Conference on Cyberspace (GCCS) scheduled on 23-24 November 2017 in New Delhi. Related events had taken place in advance of *IIAS-India* in Tel Aviv, Israel (May 2015)[2]; João Pessoa, Brazil (November 2015)[3]; Delhi, India (September 2016)[4]; Guadalajara, Mexico (December 2016)[5]; Washington, D.C., United States (April 2017)[6]; Windhoek, Namibia (May 2017)[7]; and Geneva, Switzerland (June 2017)[8]. *IIAS-India* began with a High Level Roundtable on Digital Inclusion that was followed by a workshop.

India presents unique paradoxes with regard to the internet. Only about 31 percent of India's population is connected,[9] and, yet, with more than 460 million internet users, India trails only China in terms of the largest online markets in the world.[10] India offers enormous diversity in terms of both terrain and socio-economic profile (22 official languages besides English being just one such facet) of its 1.3 billion population. In addition, 1.2 billion people in India have already been enrolled into a biometric identity project called "Aadhaar" within the last seven years, and the nation has undertaken Digital India, described as "a flagship programme of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy."[11] Because Digital India envelops so many agencies and public-private partnerships, it is a valuable model for multi-stakeholder innovation toward connecting the unconnected that can be shared through the IEEE Internet Initiative in other geographies, albeit subject to suitable tweaks as warranted under the prevailing local context. For all of these reasons, India offers a unique and exciting opportunity to examine the issues of internet inclusion across a multitude of dimensions.

[1] https://internetinitiative.ieee.org/events/conferences/advancing-solutions-for-internet-inclusion-in-india-6-october-2017
[2] https://internetinitiative.ieee.org/events/etap/ieee-experts-in-technology-and-policy-etap-tel-aviv?highlight=WyJ0ZWwiLCJhdml2IiwidGVsIGF2aXYiXQ==
[3] https://internetinitiative.ieee.org/events/conferences/igf-2016/2-uncategorised/32-igf-2015?highlight=WyJicmF6aWwiXQ==
[4] https://internetinitiative.ieee.org/events/conferences/internet-inclusion-advancing-solutions-india
[5] https://internetinitiative.ieee.org/events/conferences/igf-2016?highlight=WyJndWFkYWxhamFyYSJd
[6] https://internetinitiative.ieee.org/events/conferences/internet-inclusion-advancing-solutions-washington-d-c-2017
[7] https://internetinitiative.ieee.org/events/etap/etap-forum-in-namibia-africa
[8] https://internetinitiative.ieee.org/events/conferences/wsis-forum-2017-12-16-june?highlight=WyJnZW5ldmEiXQ==
[9] Retrieved 6 November 2017 from http://www.livemint.com/Industry/QWzIOYEsfQJknXhC3HiuVI/Number-of-Internet-users-in-India-could-cross-450-million-by.html
[10] Retrieved 6 November 2017 from https://www.statista.com/topics/2157/internet-usage-in-india/
[11] Retrieved 26 October 2017 from http://meity.gov.in/digidhan

Roundtable

The objective of the *IIAS-India* roundtable was to glean insights from a select group of experts representing government and regulators, think tanks and civil society organizations, academia and research institutions, and consulting organizations. Following a welcome address by Harish Mysore, IEEE Senior Director for India, Deepak Maheshwari, Director, Government Affairs, India and ASEAN, Symantec, and Global Vice-Chair, IEEE Internet Initiative, moderated the roundtable.

The wide-ranging discussion pivoted around the government's flagship program, Digital India. Among the topics addressed in the morning session of *IIAS-India* were defining and fulfilling the promise of internet inclusion; expanding knowledge networks through digital inclusion; assessing digital inclusion's impact on India's gross domestic product (GDP), business, development organizations, governments, and citizens; envisioning policy responses to security threats and privacy concerns; and looking at opportunities for making digital innovation more inclusive and scalable.

Discussants highlighted the huge economic impact of digital services in India, the relationship of prudent security and privacy on national security and global trade negotiations, and the potential role of technology in job creation. "I don't think there's as much appreciation of the fact that technology is going to create a lot of opportunities," one of the speakers commented. Public discourse around the internet generally has been biased toward security and privacy concerns. This, they said, at times leads to "knee-jerk" regulatory reactions and significant fear, uncertainty, and doubt among India's unconnected population, among whom digital literacy is sorely lacking. The benefits of innovations such as "big data" and artificial intelligence need to be highlighted and understood. "There has to be an appropriate balance in understanding the benefits of technology … and the harms that come from it," another speaker noted.

"Science develops at a faster rate than society can absorb and adopt," one speaker pointed out. This dynamic results in a lag for development of business models, regulations, and standards, which present their own cycles of evolution. For example, with regard to the need for new and better business models for internet services, another speaker suggested, "the one thing we have realized both in India and internationally is that demand is not the problem; monetizing is the problem." Another speaker noted the frustration of different generations and levels of government taking widely varying approaches with regard to internet regulation.

In order to significantly accelerate progress on connecting India's unconnected, participants said, a disruptive shift in fundamental posture is required along multiple fronts, such as:

- With regard to security and privacy, a paradigm shift is needed to emphasize deterrence, rather than focusing only on defense.

- Innovative models ("mid-day meal" instructions, personal digital trainers, etc.) could be adapted to shore up digital literacy among India's users.

- Calibrated and well-thought-out incentives are needed to encourage the private sector to

invest more heavily in service rollout.

- Even as we must adopt new technologies, in the meanwhile we should continue to leverage even the so-called "low-tech" and rather old-fashioned solutions, such as unstructured supplementary service data (USSD) that can work even on 2G networks and feature phones and SMS-reader apps, participants suggested.

- State governments and other agencies trying to look at telecom as a milk cow should desist from high and unreasonable charges for rights of way (RoW).

- India's education system should be leveraged much more heavily in promoting digital inclusion.

- Digital literacy, skills, and safety programs—particularly for children—must be promoted and administered online, not offline.

- Application developers must understand why unconnected people would want access to the internet and what essential capabilities they would actually pay for.

"There are huge challenges," one of the speakers admitted. "… But when I see the kind of changes that have happened (over the last 10 years) and I ask myself, 'Could I have anticipated in 2008 what kind of changes we have seen?' I think the answer is an unambiguous 'No.' And if we ask the same question 10 years from now, I think we'll come to the same answer."

The roundtable discussion offered the perfect foundation to the workshop that followed.

Workshop

Mr. Maheshwari kicked off the open, afternoon session of *IIAS-India* by welcoming delegates and reviewing the history and motivation of the IEEE Internet Initiative. One area of focus for the IEEE Internet Initiative, he said, is internet inclusion—extending affordable, meaningful internet access to the estimated 60 percent of people around the world who today remain unconnected.

Karen McCabe, Senior Director of Technology Policy and International Affairs, IEEE, outlined interrelated hurdles to connecting the unconnected in India and other markets. She said one of the tasks of *IIAS-India* was to identify gaps and explore how to focus potential IEEE outputs, which could be roadmaps, frameworks, or common definitions, for example. Srikanth Chandrasekaran, Senior Director, Standards and Technology for India, provided a brief overview of IEEE Standards Association (IEEE-SA) Industry Connections. The program is an example of the IEEE-SA's work in pre-standards development and offers alternatives for technologists to work collaboratively in a light-weight process and quickly achieve the consensus and produce the output that they require.

Following personal introductions by the *IIAS-India* participants, Mr. Maheshwari briefed the group on the afternoon activity. Via a collective process, participants would be clustered to prioritize challenges, define problem statements, and identify possible approaches and solutions that could be adopted and used to frame efforts to promote equitable access and use of the internet in India

and elsewhere.

Identifying Key Challenges

During the brainstorming session to identify key challenges, participants voiced a wide range of issues inhibiting progress toward connecting the unconnected in India:

- "A huge divide between the haves and the have-nots" of internet access is being created in India.
- "Is skepticism among the public one of the reasons they are not adopting, and, if so, is that just skepticism of something that is new or is the skepticism from privacy concerns?"
- Mobile is viewed "as a panacea for this problem, but the reality is that only about 60 percent of the people in India have access to mobile."
- "Maintenance costs have not been budgeted, and lack of [grid] power" is widespread.
- "In terms of policy and regulatory aspects, do we define internet as a public utility?"
- "Do we need mandates to ensure availability or a certain quality of connectivity?"
- "How do we integrate [and adopt] privacy and security by design?"
- "In a market that might not be that strong, what are the [killer] applications that are likely … to engender [accelerated] demand?"
- "Technology does not operate in a neutral way. We need to keep in mind the profound implications of who is able to access technology."

Clustering Identified Challenges

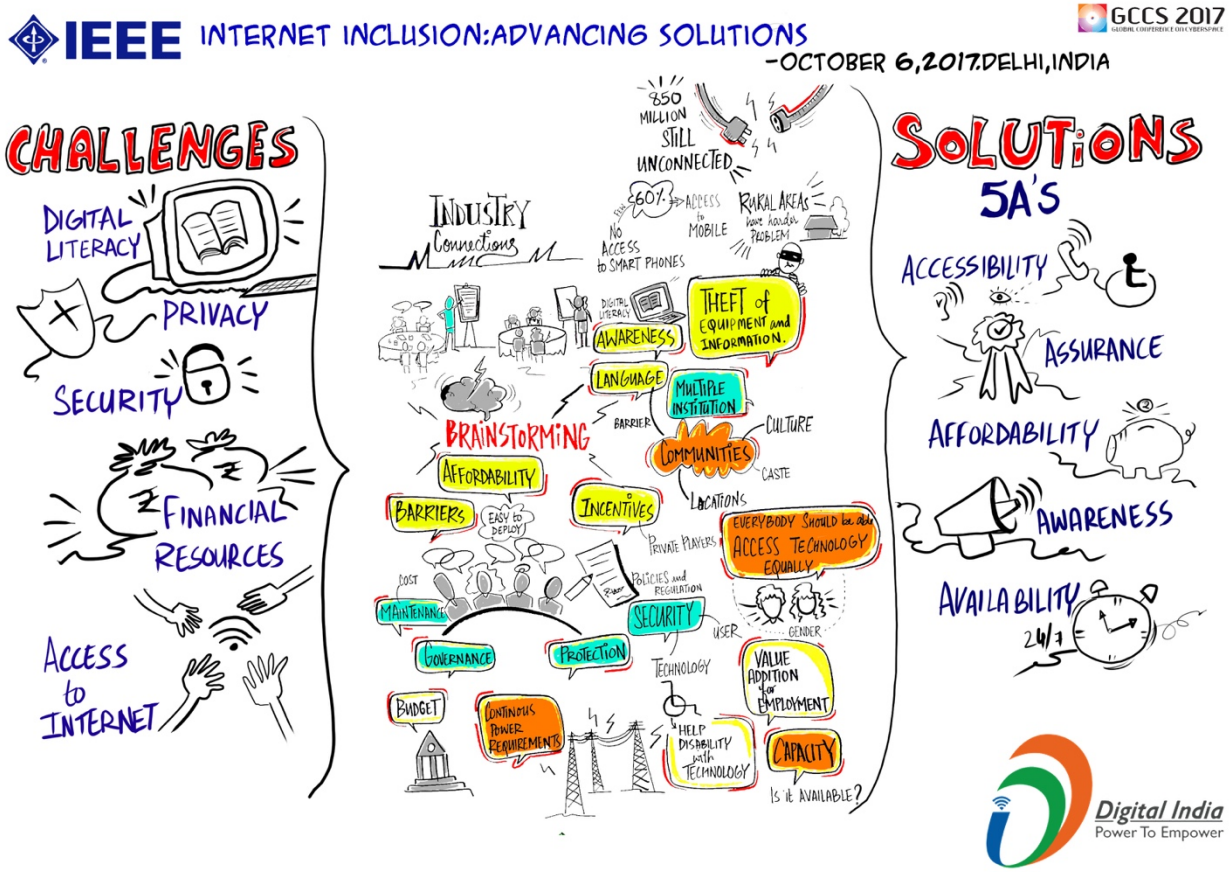
Brookings India Research Fellow Rahul Tongia and Mr. Maheshwari facilitated clustering of the challenges along five dimensions, described by the participants as the "5 A's":

- Availability—Is some kind of access available (irrespective of cost, device, service quality, etc.)?
- Affordability— Are the costs of devices (often a smartphone), connectivity (data charges) and ongoing services (subscriptions, apps, and in-app purchases) affordable with respect to the paying capacity of different socio-economic strata?
- Accessibility—What cultural/social/logistical barriers prevent unconnected people from connecting to the internet?
- Awareness—Do people know, appreciate, and internalize what to do with access even if

they have it, and do they have the skills to realize the potential of the same?

- Assurance—At what levels of security, privacy, quality, etc. is the access available? What is or should be the regulatory and institutional framework? What are the qualitative and quantitative aspects of these issues?

Participants then worked in five breakout groups, each focused on one of these dimensions, to ideate challenges and potential solutions, recommendations, and next steps.

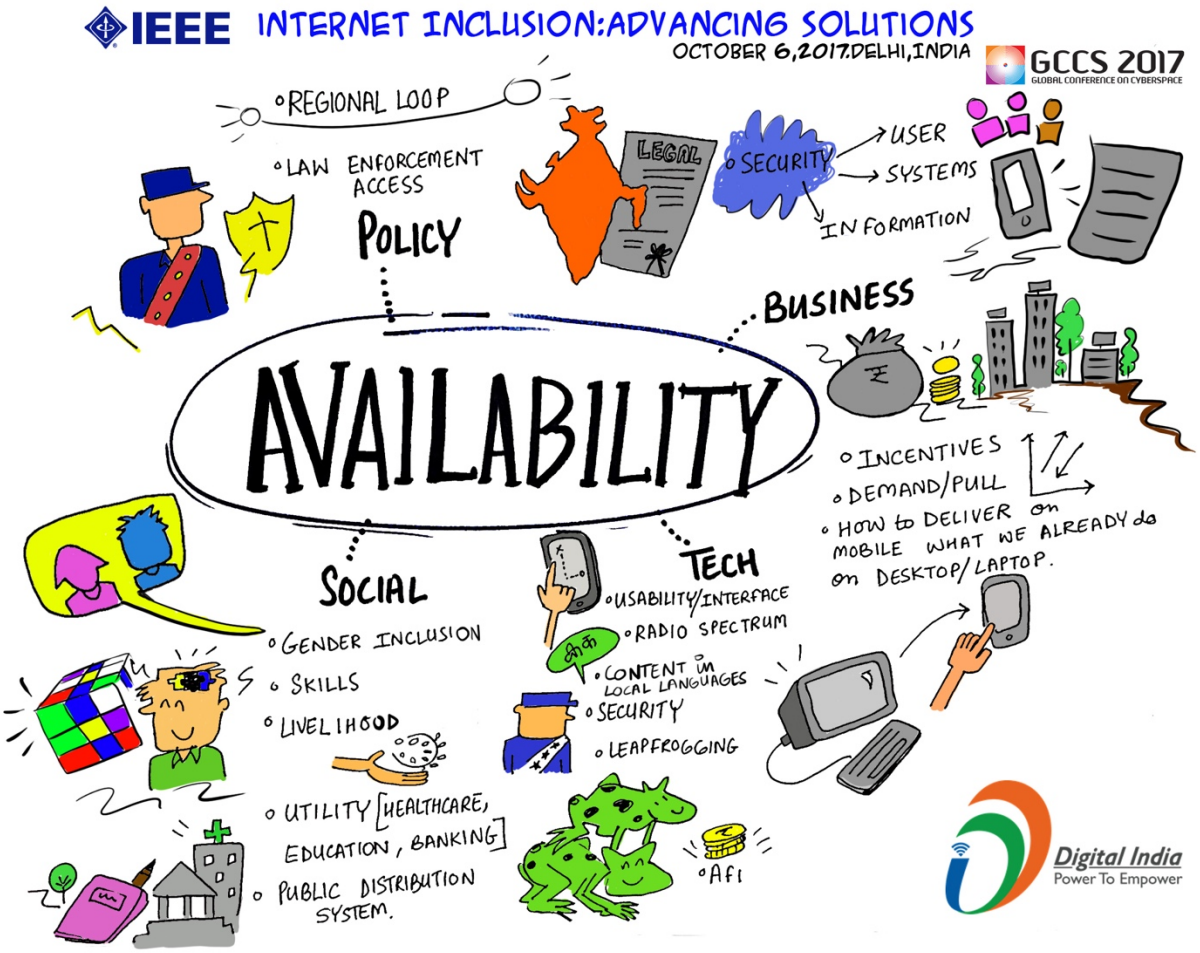


Availability

Lack of proper coordination among the multiple institutions and agencies involved in rolling out services was identified as a significant challenge to internet diffusion in India, as services are provisioned through different institutions at different layers and levels. In some regions, the government has deployed fiber optical lines, but network operators do not perceive the advantageous business model to move forward with delivery of last-mile connectivity. There also is a substantial problem of lack of reliable power in many villages, as well as a need to expand backhaul infrastructure capacity. Furthermore, limited spectrum availability and usage have strained existing networks and, thus, inhibited provision of quality services.

With regard to solutions in this area, substantial collaboration and partnership among stakeholders

across all segments of society are required to make meaningful progress on availability, participants said. They identified the need for a more conducive regulatory framework to break the logjam in rural, sparsely populated regions, and they discussed the value of public/private/panchayat partnerships for expanding access via community networks in such rural areas—private operators could shoulder the capital expenditures (CAPEX) of network deployment, with the operational expenditures (OPEX) associated with bandwidth, extension of the network into the village, and maintenance being borne by the gram panchayats[12]. Viability gap funding could be sourced from the Universal Service Obligation Fund (USOF) or government institutions.



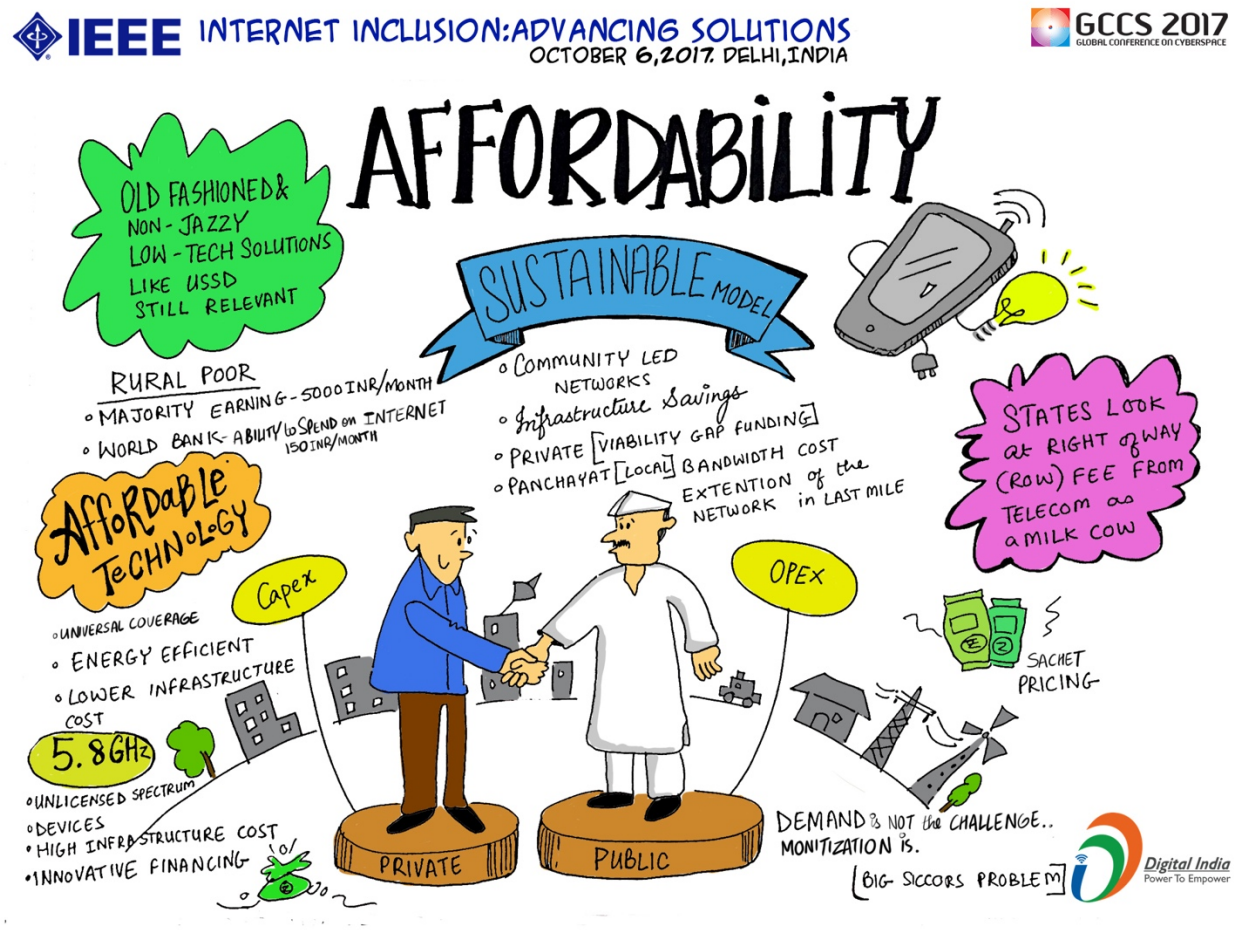
Affordability

The low capacity to pay for internet services and access devices was identified as a terrific challenge, particularly among India's least-connected populations. Participants noted that the cost of information and communications technology (ICT) services in India is relatively low compared to much of the rest of the world. Nonetheless, the World Bank assesses the capacity to pay for

[12] There are approximately 238,000 gram panchayats, democratically elected units of local government for the 600,000 plus villages in India. Bharat Net is extending the connectivity from nearest urban area to each of the gram panchayats, predominantly but not exclusively via optical fiber. Rollout of Bharat Net is being funded via the USOF.

internet services at about 150 rupees per month, given the typical earnings of India's rural poor (about 5,000 rupees per month). Also, while participants estimated that 80 percent of user access goes though smartphones, they said access to those and other devices (laptops, computers, notebooks, etc.) remains limited by their cost.

As for solutions, participants said reduction in price of services would spur expansion of connectivity. Participants discussed utilizing the unlicensed spectrum such as the 5.725-5.825 GHz band and especially (for cost and energy efficiency) unused TV white spaces to facilitate delivery of affordable internet service of an assured quality and cited an IIT Bombay study supporting the potential efficacy of such solutions. A testbed project to better utilize TV white spaces in the Palghar region of India's Maharashtra state was cited. Because of the its ability to support data transmission without direct line of sight, the technology can support services over a large geographic footprint. The associated energy and infrastructure savings can contribute to lower-priced services.



Accessibility

Participants defined three broad areas of accessibility challenges: economic, social, and cultural. For example, as to cultural barriers, they noted that some people in India's rural areas resist or restrict technology adoption, because of discomfort and distrust with something new. In addition,

they said, there exist considerable social barriers—especially along the lines of gender, caste, age, and disabilities. Lack of literacy amongst a significant population is a challenge in itself but gets accentuated when it comes to digital literacy. Also, while many people see the internet as a means to send or spend money, they do not so often see it as a tool for creating a positive impact on livelihoods, economic opportunities, and social mobility.

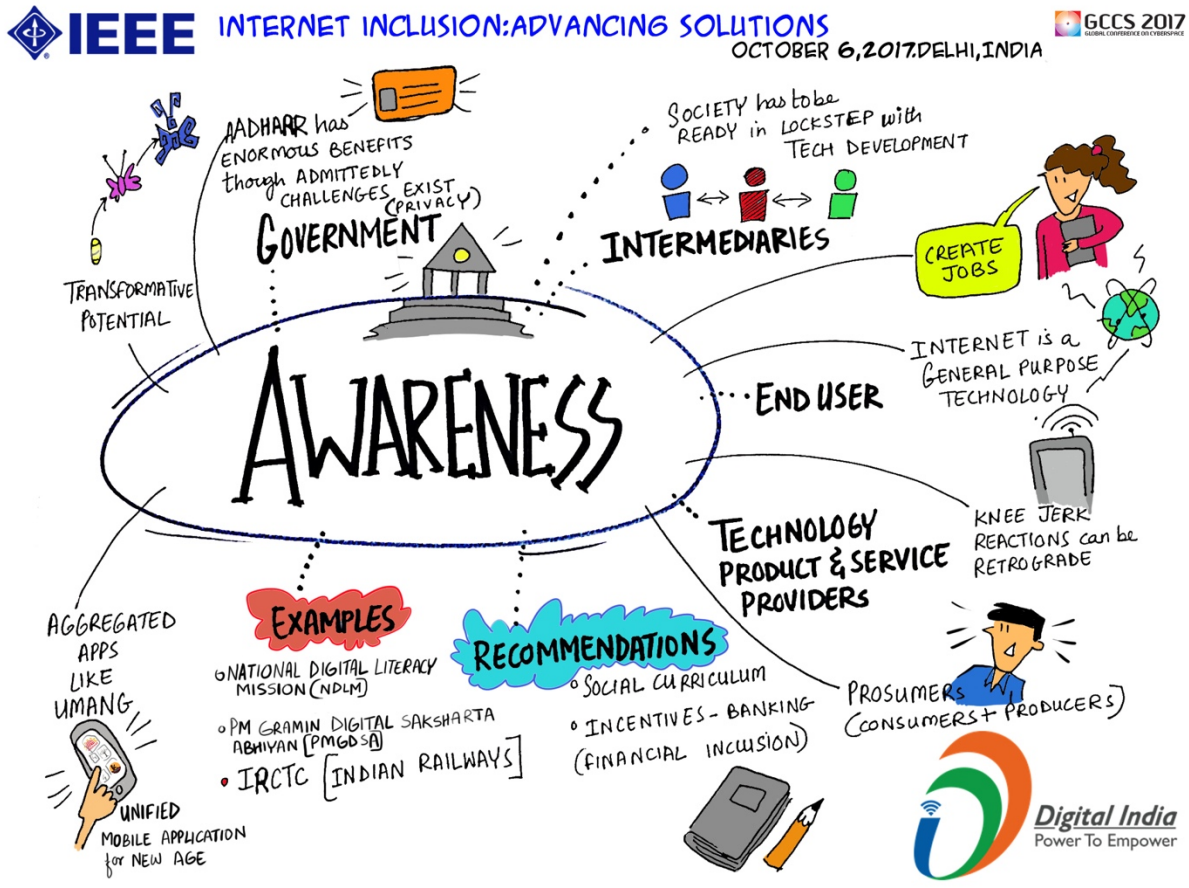
The most important solution to improving accessibility, participants said, is to raise awareness around usefulness and the economic and social value of the internet, especially with regard to job creation. Locally relevant services and applications in local languages—the "killer apps"—must be identified. Increasing use of audio-visual content and menu options, Braille interfaces, etc., were identified as key potential solutions for enhancing access amongst disproportionately unconnected segments of the Indian pollution and accelerating realization of the National Digital Literacy Mission.

Awareness

Participants identified a host of questions in considering the challenges related to awareness from both the supply side and demand side of internet service: Do people know what to do with access if they had it and how to do those things? Amongst whom must awareness be created and how? What intermediaries (NGOs, civil societies, etc.) could partner with government on at least an ad-hoc basis to advance awareness? What incentives could be created for end users so as to drive an

impact on usage, and what would be the broader ramifications of implementing such potential incentives?

Because so many stakeholders are involved in internet delivery in India, workshop participants said solutions for boosting awareness and digital literacy/skills are needed at each level. So, for example, while India's policy landscape for cybersecurity and data privacy are weak and must be improved, users at the same time must do their part by exhibiting better digital hygiene practices (such as having strong passwords, not sharing passwords, etc.) In rural areas, village-level entrepreneurs (VLEs) could be identified and assigned the responsibility for enhancing digital literacy among users; plus, they said, maybe there is an opportunity to better leverage school curricula and banking, for example, in delivering on India's National Digital Literacy Mission. Participants recommended adopting a data-centric approach to understanding the diverse awareness requirements among different segments of the Indian population.

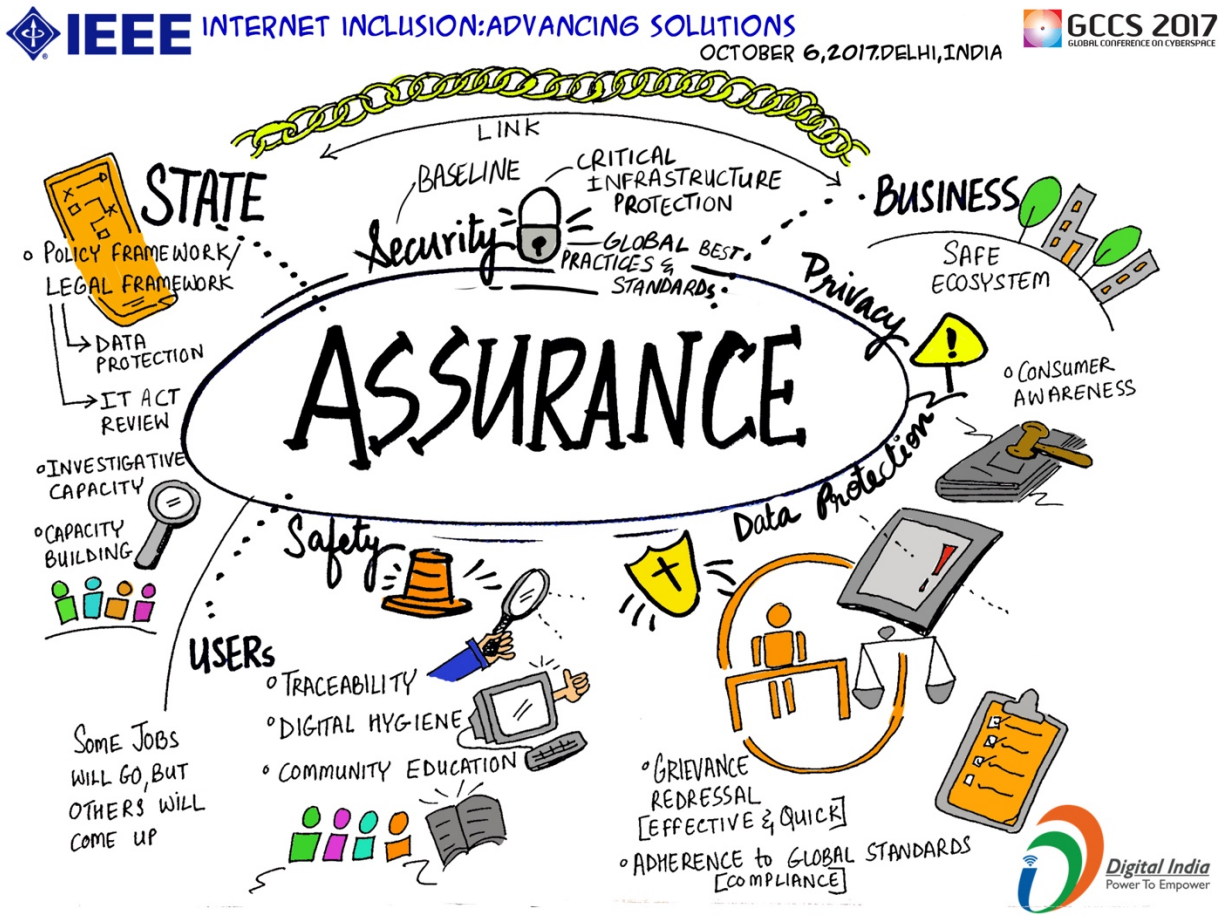


Assurance

Participants agreed that challenges related to the assurance of privacy, security, and quality exacerbate obstacles in other areas. For example, the fear of cyber crime (such as fraud in online financial services) and privacy being compromised might be hindering internet demand in India There is a tension between the need to equip law enforcement to better protect internet users and providers and a fear of increased monitoring and surveillance. Also, inconsistency in service

quality was identified as a deterrent to service uptake; participants said that mobile phone subscribers of 4G or 3G data services experience varying quality of service depending on where in India or at what time of day the service is used.

Possible solutions would be assessing the current ability of Indian states to deal with cyber threats in terms of detection, investigation, law enforcement, precaution, etc.—and then linking findings to policy and legal frameworks. Furthermore, businesses should build out an ecosystem of safety by incorporating principles such as privacy by design, privacy by research, and other standard data-protection principles in their service and business models. Timely notifications of data breaches, for example, would boost consumer confidence, and efficient redressal methods should be established.



Presentation on IEEE-SA Industry Connections Program

Introduced by Mr. Chandrasekaran at *IIAS-India*, the IEEE-SA Industry Connections program helps incubate new standards and related products and services by facilitating collaboration among organizations and individuals as they hone and refine their thinking on rapidly changing technologies.

The program offers an efficient, economical environment for building consensus and producing

shared results, empowering groups with a customizable menu of IEEE and IEEE-SA resources to produce "fast-track" content and deliverables:

- proposals for standards;
- white papers;
- peer-reviewed guides and position papers;
- conferences, workshops, and other events;
- databases and registration services;
- software, tools, and web services; and/or
- other jointly developed results.

Current Industry Connections activities address a wide variety of technical areas and issues.[13] The program may also provide an appropriate environment for follow-up working groups coming out of *IIAS-India*.

Presentation on GCCS 2017

Mr. Premjit Lal, Director, Infrastructure and E-services, National e-Governance Division, Minsitry of Electronics & IT, gave a presentation at *IIAS-India* on the upcoming Global Conference on Cyber Space (GCCS)[14], scheduled to be held in New Delhi on 23-24 November 2017. He shared the main theme, "Cyber4All: A Safe, Secure and Inclusive Cyberspace for Sustainable Development," and four sub-themes: "Cyber4Growth," "Cyber4DigitalInclusion," "Cyber4Security," and "Cyber4Diplomacy." He exhorted *IIAS-India* participants to register and added that the sessions would also be webcasted live for those unable to attend in person.

Closing Remarks

Ms. McCabe and Mr. Maheshwari thanked the *IIAS-India* participants and encouraged them to reach out with their interest in leading or participating or contributing within the working groups to be formed around the "5 A's" dimensions.

IEEE is eager to expand the conversation about internet inclusion, prioritize next steps, and further explore the opportunities for extending affordable internet access to more and more people around the globe. Please visit http://internetinitiative.ieee.org or email internetinitiative@ieee.org for more information.

[13] http://standards.ieee.org/develop/indconn/activities.html
[14] https://gccs2017.in/