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**Bringing
Mass Broadband
to India**
*Roles for Government
and Industry*



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EXECUTIVE SUMMARY

For a country of its size and stage of economic growth, India is notably lagging its peers in broadband penetration. To date, market forces have not been sufficient to spread the technology beyond prosperous enclaves in major cities, due to cost constraints (high PC prices, in particular); lack of compelling local content; limited availability; and a fragmented group of industry operators, particularly cable providers.

For broadband to become a mass medium in the country, both industry and the Indian government must take more concerted action to address these issues. On the private-sector side, cable and telecom companies must work to ensure ubiquitous supply, by clarifying the strengths and competitive positions of various broadband technologies and their applicability in different segments. Jointly, the government and industry must work to spur the creation of a robust local online content industry. Among government's responsibilities are putting more civic functions online, establishing a policy at the national and local levels to streamline right-of-way access for the rollout of a fixed network, and encouraging the corporatization and digitization of the cable industry, particularly of the local system operators. Most significantly, the government needs to establish a national policy that aims to advance fixed-line infrastructure more rapidly than the current market-based approach.

KEY HIGHLIGHTS

- Increasing broadband penetration in India could translate into greater labor productivity and numerous social benefits.
- At present, penetration is limited by broadband's current attractiveness, availability, and—to a lesser degree—affordability. Government and industry both must address these issues.
- Operators must determine which platforms make the most sense for each targeted market segment and roll them out accordingly.
- Governments must drive broadband usage with services that are easy and appealing for citizens, as well as develop policy to promote and roll out next-generation fixed-line infrastructure.

THE CURRENT STATUS OF BROADBAND IN INDIA

Universally accessible, inexpensive broadband can play a key role in spurring a country's educational achievement, social progress, and economic development. Nations that consistently rank in the top tier of broadband penetration worldwide post twice the rate of GDP growth of countries in the bottom tier. In addition, every 10 percent increase in broadband penetration translates to a 1.5 percent increase in labor productivity.¹

This broadband dividend comes through a variety of means: e-health initiatives, greater opportunities for education and entrepreneurialism, and

improved access to government services for people in remote areas. The potential for these benefits is perhaps even more pronounced in India, with its large population of low-income people and a growing economy that would be strongly receptive to the manifold advantages of widespread broadband.

Yet broadband penetration in India is extremely low—just 3.2 percent of Indian households, or roughly 7 million broadband subscriptions, far shy of the ambitious government goal of 20 million connections by the end of 2010. Current broadband customers are primarily concentrated in central business districts (CBDs) or the high-end residential areas of larger cities. These customers have Internet connections either through fixed-line DSL service offered by incumbent and competitive telecom operators, or through cable television services from local multiple-system operators (MSOs). In this way, broadband is almost a class phenomenon, with semi-urban and rural areas virtually excluded.

ROADBLOCKS ON INDIA'S DIGITAL HIGHWAY

Two key factors have prevented the widespread adoption of broadband technology thus far—namely a failure to make the medium sufficiently attractive and a lack of availability. A third element, affordability, has been a significant barrier in the past, but current and anticipated developments have driven down the costs of PCs and Internet subscriptions, making pricing less of a hurdle for most consumers in the coming years. However, the remaining two issues will be more difficult to rectify.

Attractiveness

India lacks a critical mass of high-demand applications that would generate new users. Although some content has started migrating online, content that is locally relevant and locally available continues to lag. Other markets give a clear indication of the types of applications likely to appeal: Most common are entertainment (admittedly a largely discretionary category), education, and civic sites, such as e-government functions, online payment of taxes, permits, approvals, and the like. For example, one of the primary uses of broadband in Turkey has been the online tracking of children's education and tuition. In Korea, housewives and

mothers constitute the main market, primarily for online lessons aimed at better preparing their kids for school. Singapore and Malta have best-in-class e-government applications for residents to file information online.

The government of India has begun deploying some locally relevant applications, particularly at the state level. In Karnataka, a locally developed application called Bhoomi is used to put land records online in a transparent format for residents; in Andhra Pradesh, eSeva Kendras (i.e., e-government outlets) handle a wide range of local government functions. India's national government has also established the National Institute for Smart Government (NISG) with the goal of migrating services online. Yet these are tentative, early steps, and progress has been slow thus far, primarily because of a lack of capability and execution speed, rather than a lack of funds.

Finally, entertainment is a big driver. Internet access is increasingly being spurred by video and peer-to-peer applications, and this trend—especially in a content-rich culture such as India's—may represent a powerful force for increasing high-bandwidth demand.

Availability

The second barrier preventing more widespread penetration of broadband in India—availability—is a product of the relatively peculiar telecommunications landscape. Unlike other countries, India has not experienced a smooth progression of preceding technologies that would point the way toward an obvious evolution to broadband. DSL is perhaps the most common evolution path in other countries, but with only 45 million fixed-line telephone subscribers in a country of 1.1 billion people, India simply does not have a sufficiently large base of wired households ready to upgrade.

Cable broadband has a larger base of subscribers—roughly 90 million as of 2009,² again primarily in urban areas. However, those subscriptions are controlled by MSOs, which are numerous, small, and still largely unorganized. These MSOs, with a few exceptions, lack both the scale

and the means to upgrade, expand, and digitize their networks in order to offer broadband to the masses. Most critically, they also at times lack control of the actual cable lines that reach all the way to each household. Instead, MSOs secure last-mile access through franchise deals with local cable operators (LCOs); and these LCOs have developed a strong vested interest in keeping their largely unregulated networks analog, further inhibiting industry growth.

Mobile broadband may start gaining traction now, with the conclusion of broadband wireless access (BWA) spectrum auctions and the more prevalent 3G. In other markets, 3G has been adopted primarily as a voice platform, where it has served to drive down calling costs, and BWA has been more widely used as a mobile broadband platform. However, in India, calling costs are already low, and there is huge demand for broadband. In this context, even 3G, with its limited capabilities compared to BWA, may

become a viable option for driving mobile broadband in the country. Regardless of platform, however, wireless may mostly serve as a stopgap solution, and does not obviate the need for industry and government to address the serious underlying issues preventing the rollout of a fixed-line network, from a national public policy and competitiveness perspective.

Affordability

Between the two main costs for broadband users—access platform (e.g., PCs/laptops and, potentially, wide-screen mobile devices) and a monthly Internet subscription—the PC cost remains the higher entry barrier. Locally assembled desktop PCs are among the lowest-priced in the world, with unbranded models selling below US\$500. Yet that is still the equivalent of an average middle-class family's monthly income.

Paradoxically, subscription charges in India are among the lowest globally

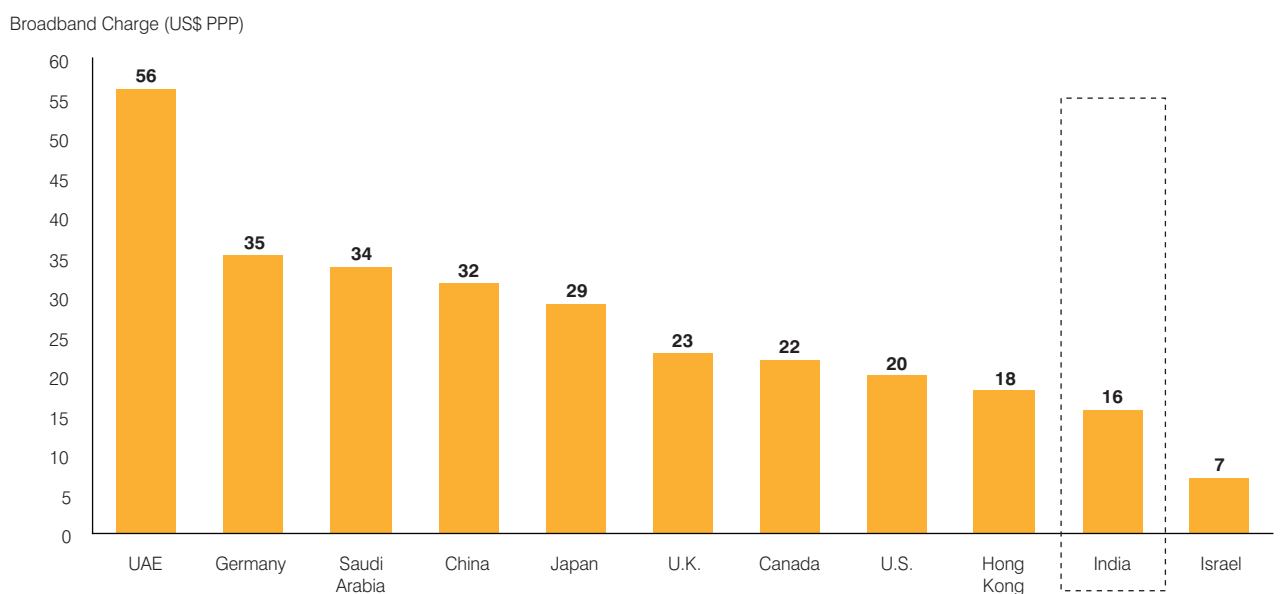
(see Exhibit 1). If these low prices genuinely reflect a lower cost base for India's operators compared to those in other markets, this represents good news for future growth prospects and may reinforce the hypothesis that the industry is constrained more by attractiveness and availability.

If, however, low consumer prices are the outcome of price competition in a currently irrational market, then the prevalence of such prices may actually pose a significant hindrance to future market growth. Most indications point toward the latter as a more likely explanation—an

irrational market in which price competition forces operators to sell broadband access at or below its actual cost. If this is true, sustainable growth in the industry will require a dual approach: bringing prices to a more sustainable level while simultaneously reducing operating costs.

Exhibit 1
Access Charges in India Are Among the Lowest in the World

MONTHLY BROADBAND CHARGES¹
 (for 256 Kbps line and at least 1 GB of data usage)



¹ In U.S. dollars on a purchasing power parity (PPP) basis.
 Source: "Measuring the Information Society," International Telecommunication Union, 2010; Booz & Company analysis

KEY STEPS FOR OPERATORS

All three of these problems—attractiveness, availability, and affordability—will require a concerted, coordinated effort from both policymakers and industry operators, often working on the same issue from different sides. For example, in terms of affordability, operators must leverage the inevitable price reductions in PCs to make broadband service more appealing to potential customers. A Booz & Company forecast predicts that advances in production technology could reduce the price of an entry-level PC by nearly half, to roughly \$300,³ which would vastly expand the consumer base for PCs in India.

At the same time, more stripped-down laptops and subnotebooks developed primarily for Internet access (for example, the eee PC from Asus) have further lowered the financial barrier to owning a home device. Some telecom operators in other global markets have bundled these devices with basic Internet service, reducing the initial outlay for a computer and monthly broadband service. Such initiatives in the Indian market, which currently has no bundled offerings, would likely find receptive buyers.

The emergence of mobile broadband would require an upgrade of the current “third screen” (i.e., a mobile handset, after TV and PC), to enable viable browsing. The growth in the mobile-voice market has led to the development of a strong ecosys-

tem surrounding this technology, with both multinationals and local companies establishing their presence. Going forward, while iPads may continue to remain niche products, similar high-resolution, highly portable handhelds at much lower prices are crucial if mobile browsing is to become more attractive to consumers. This is a market opportunity waiting to be tapped, potentially by operators working in conjunction with tech companies.

Operators can also work to reduce their operating costs, which would not only address the affordability issue for consumers but also establish more rational market principles, establishing a stable foundation for growth in the sector. Potential cost reductions require a comprehensive look at all the cost elements involved in delivering Internet access to the end consumer. As an example, on content access and delivery alone, potential reductions may be achieved in two ways: first, by spurring the creation of more locally produced and locally relevant content, which would in turn reduce operators’ international transit requirements (and also increase the attractiveness of the medium to local users); and second, in parallel, by reducing the cost to access foreign content. This second element may require, among other things, more and better peering arrangements between Tier 1 and Tier 2/3 ISPs.

To this end, the industry has established the National Internet Exchange of India (NIXI), a nonprofit collective that facilitates the domestic flow of Internet traffic among peered member ISPs in order to reduce costs. Although the organization has a solid and growing membership in the country's most populous regions, several states still have broadband infrastructure in place but no peered ISPs in the exchange. Increasing membership among ISPs in those states could help reduce transit charges and thus bring down the cost of content.

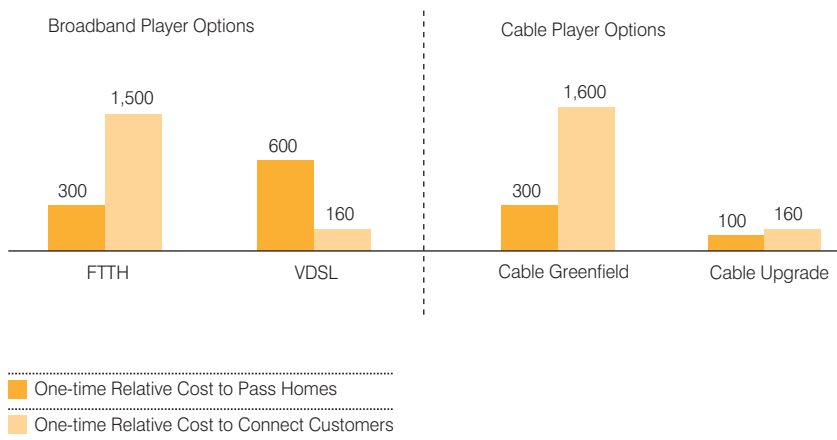
To resolve the issue of availability, operators need to clarify the advantages and disadvantages of specific platforms, particularly in how they apply to users with different demands for the technology. A more targeted approach could help opera-

tors effectively identify and persuade potential consumers, increasing demand and expediting the rollout of their networks. For example, among fixed-line broadband platforms, both fiber-optic lines (FTTx) and cable offer high bandwidth (100 Mbps and up), yet the former may be a superior platform for the enterprise market, which has greater security and reliability requirements. Telecom operators that can offer FTTx also traditionally have greater strengths in services and applications than cable providers, making them a more likely solution for enterprises. Currently, most corporate users get broadband from telecom operators, and the private operators with ambitions to establish a fixed-line presence have declared that broadband is a priority for them.

Cable, with its emphasis on triple-play packages, offers significant cost and viability advantages for servicing the residential segment (see Exhibit 2). Cable already has twice the reach of fixed-line telephony in India—an estimated 90 million customers, versus 45 million—primarily delivered through the unwieldy LCO market. To expand on that base of customers and upgrade them to broadband, the country's LCOs must recognize the imperatives to upgrade their networks, given the increasing threat from direct-to-home service to their core revenue streams on video. To do so, they should consider organizing themselves into a coherent front with sufficient clout to influence policy and convince the government to offer them a feasible path to upgrade their networks, and obtain targeted access to capital, while continuing to access content on viable terms.

Exhibit 2
Cable Operators Have Significant Advantages in Residential Broadband

RELATIVE COSTS IN URBAN AREAS



Note: Although these costs will vary by market, they remain fairly constant relative to each other. Therefore, we have designated a base rate of 100 for cost to connect via cable upgrade; this indicates the relative cost of other options.
Source: Booz & Company

Wireless broadband also has attractive elements, particularly in a market like India's, which lacks a fixed network of any credible size. Mobile broadband is relatively easy to roll out and offers increasingly acceptable speeds. However, wireless is at most a complement to a fixed-line network, and may not be a definitive option as the country's only broadband platform. It lacks the speed, security, scalability, and reliability needed to become a truly mass medium, and rapidly loses its cost advantage over the fixed even

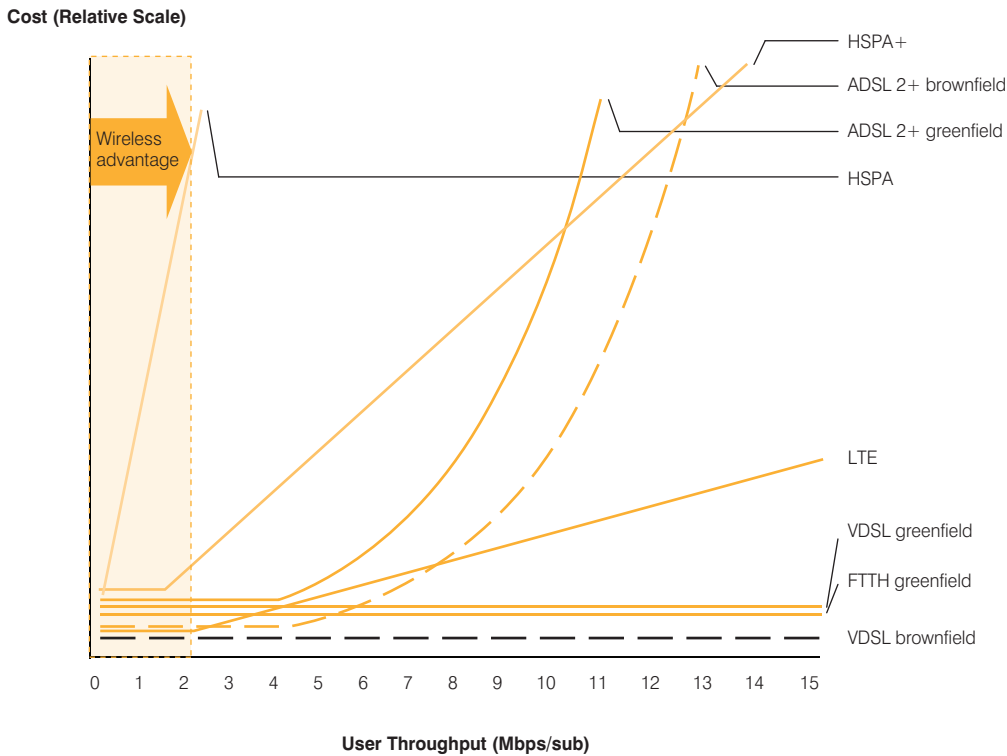
at moderate bandwidths (see Exhibit 3). Because of this, an overreliance on wireless as the answer to India's broadband problem could be limiting and take the industry's, and government's, focus away from fixed-line priorities.

Satellite falls in the same category as wireless. Recent developments in the satellite space in India make this a good platform for expanded coverage, particularly in isolated rural communities, which continue to suffer from

an almost complete lack of broadband access. The main bottleneck in deploying broadband in particularly isolated rural areas is the backhaul and not the last mile. The Ka band in the satellite spectrum (17–30 GHz) is one possible solution to this bottleneck. However, the Ka band is still mired in regulatory fluidity, without a clear government stance. Operators could lobby policymakers to resolve this issue as one part of a larger strategy to drive broadband access.

Exhibit 3
Relative Strengths of Wireless

TOTAL COST OF OWNERSHIP
(Dense Urban Areas)



Note: Assuming 5 MHz, 16-QAM, SISO for HSPA at 2.1 GHz/10 MHz. 64-QAM and 2x2 MIMO for HSPA+ at 2.1 GHz/20 MHz, 64-QAM and 4x4 MIMO for LTE at 2.6 GHz, all in three sector sites. Assuming similar civil and equipment costs for greenfield deployment of FTTH, VDSL, and ADSL 2+ of around US\$540/sub. Source: Booz & Company

KEY STEPS FOR GOVERNMENT

If telecom and cable operators were to succeed in addressing the supply of broadband, the government would be responsible for creating demand for its use: Policymakers must address the fundamental limitations preventing more widespread adoption of broadband.

Regarding attractiveness, the government could drive demand by putting more of its services and forms online (in parallel with traditional print versions), and encouraging state and local governments to take similar steps. The national government could also provide incentives for Indian media companies and content producers to create more local applications that would resonate with Internet users in the country, as well as make India an attractive destination for local mirroring of popular global sites. This may require a reevaluation of the country's media presence and censorship guidelines. The government needs to consider the extent to which it may be ready to ease its stance on an admittedly touchy subject.

To deal with affordability issues, the government has a range of potential initiatives. First, it should continue to spur the local assembly of PCs, which would lower the cost of those machines for buyers. And, recognizing that the global reach of the Internet virtually ensures that much content for Indian subscribers—as in most other countries—will continue to come from outside its borders, the national government should work to strengthen the in-country hosting architecture for foreign content as mentioned above—that is, facilitating peering among local ISPs, and working to reduce international gateway and IP transit costs.

Regarding availability, the government has perhaps a larger role to play. It could free up the Ka band for satellite broadband, primarily as a backhaul platform to drive penetration in isolated and far-flung parts of the country.

More significantly, the government could help mitigate the costs to operators of building the necessary

infrastructure by implementing a policy clarifying procedures for the local rights of way (RoWs) needed to install new fixed lines in the last mile. This has been a significant hindrance to both cable companies and telecom operators, in that RoWs represent up to 50 percent of the total cost of laying a line in urban areas and almost always require coordination with multiple entities.

A policy at all levels of the government—federal, state, and, most critically, local—could streamline this process by establishing RoW access whenever roads are built or upgraded (e.g., as part of a new development code to be followed for all real estate development or refurbishment), or when utilities networks are created or refurbished. It could then mandatorily convert the access to those lines into a marketable commodity that local utilities (water, sewer, and power companies) and local bodies such as municipalities and panchayats could sell off. Such a policy would serve several purposes: reducing capital expenditures for telecom operators and cable companies, increasing broadband infrastructure by making it easier to roll out multiple networks (which globally has the highest correlation to penetration), and—as a

bonus—generating income for these local bodies and utilities.

For reasons of national competitiveness, a ubiquitous fixed-line network is indispensable. Wireless has attractive features, but could be expensive and too limited in bandwidth to truly address India's broadband needs over the next 18 to 24 months and beyond. Because mobile operators will increasingly invest in fiber backhaul as they move to higher bandwidth technologies (e.g., 3G and 4G), the government may wish to consider a policy regime that encourages operators to diversify into fixed broadband by leveraging this asset.

In parallel, the government may also wish to proactively encourage an upgrade of the LCO sector. Developing an industry evolution plan that allows these LCOs to digitize and regularize their operations, or risk being left out, could allow this strong but currently hidden asset to play its rightful role in ensuring widespread broadband availability to the masses.

Even these approaches, however, are more in the category of small improvements to an existing system, rather than a bold approach that

would advance India's broadband infrastructure to the next generation.

Ideally, the government's primary role should be restricted to identifying and clearing up bottlenecks in the rollout of technologies, rather than choosing technologies itself. Those decisions are better left to the market. However, even in other countries, a market-based approach has not been sufficient to establish a robust, ubiquitous, fixed-line next-generation network.

Because of the relative failure to date of the market-based approach on this particular front, the government in India could elect to take a more active role. At a fundamental level, it must develop a policy that explicitly addresses how best to promote and roll out fixed-line infrastructures in the country, particularly those using next-generation technology. Various approaches have worked in other markets—specific policy biases favoring one platform over another, as in the U.S.; active funding of established players, as in Malaysia; or creating a new industry structure, as in Singapore. A more in-depth analysis of these approaches and their relevance to the situation in India is needed (*see "Looking to the Next Generation"*).

Looking to the Next Generation

Next-generation national broadband networks (NGNBNs) offer countries the rapid transfer of information, services, and benefits, promoting overall growth, productivity, and prosperity. However, given the significant technological and economic challenges in implementing such networks, NGNBNs have required a significant push from governments to put them in place.

India could witness the increasing expansion of the fixed-line network over the coming years, particularly if steps such as those outlined in this paper are adopted. This would go a long way in assuring that the majority of the population has minimum scalable broadband access, backed by a reasonable fiber/hybrid-fiber network.

However, fiber is not equivalent to a NGNBN. To roll out true next-generation networks in India, the government needs to adopt a proactive stance—although the time for that may be in the future, after basic broadband targets have been achieved.

When that time comes, it is critical to get the NGNBN ecosystem correct from the start. At the very least, the government should take a prescriptive approach to laying out the network's architectural specifications, ensuring that whatever gets rolled out is truly scalable. Furthermore, given the sheer scale of investment necessary, a high degree of government assistance is perhaps unavoidable. The government would need to decide the framework for such assistance—for instance, which areas would be eligible, and what form such assistance would take. The government could choose to introduce new business models, invest in network infrastructure, stimulate demand, or some combination thereof. For more information, see the Booz & Company Perspective “Digital Highways: The Role of Government in 21st-Century Infrastructure.”⁴

The government in India must develop a policy that explicitly addresses how best to promote and roll out fixed-line infrastructures in the country.

CONCLUSION

The current constraints on broadband penetration in India are profound but solvable. A coordinated approach between industry and government could remove the biggest obstacles and drive a more widespread adoption of the technology. Among various initiatives, the main priorities should be clarifying the strengths and weaknesses of compet-

ing platforms; establishing a national policy that aims to advance fixed-line penetration, primarily outside of main population centers; increasing the amount of locally relevant and attractive content; and reducing the industry's operating costs. These measures are critical for India to stay on its current path of healthy economic development.

Endnotes

¹ Karim Sabbagh, Roman Friedrich, Bahjat El-Darwiche, and Milind Singh, "Enabling Sustainable Digital Highways: Strategies for Next-Generation Broadband"; http://www.booz.com/global/home/what_we_think/reports_and_white_papers/ic-display/47867735.

² Media Partners Asia Ltd.

³ Gregor Harter, Barry Jaruzelski, Alex Koster, and Vanessa Hyde, "PCs in the Enterprise: Reinvention or Demise?"; http://www.booz.com/global/home/what_we_think/reports_and_white_papers/ic-display/47349336.

⁴ Roman Friedrich, Karim Sabbagh, Bahjat El-Darwiche, and Milind Singh, "Digital Highways: The Role of Government in 21st-Century Infrastructure"; http://www.booz.com/global/home/what_we_think/reports_and_white_papers/ic-display/46630268.

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