

Reaching the Third Billion: Arriving at Affordable Broadband to Stimulate Economic Transformation in Emerging Markets

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Direct correlations can be made between the affordability of broadband connectivity and the ability of an individual or country to successfully transform itself through the utilization of ICT capabilities. Advocating reaching more people by paying “less for less,” strategies employed in many different countries aim to close the affordability gap. In short, these countries are employing business and deployment strategies similar to those of the pre-paid mobile phone market that enabled it to successfully reach the majority of the world’s population.

An International Telecommunication Union (ITU) study recently indicated that Internet users have now surpassed the 2 billion mark worldwide.¹ This is significant because access to the Internet is clearly a major enabler of economic growth. Accessing information and education, facilitating the creation and reach of businesses, streamlining the costs of engaging with governments, and obtaining healthcare are all cited as benefits of access to the Internet.

As we celebrate the progress and begin to experience the individual, economic, and social transformation of surpassing 2 billion Internet users, we turn our attention to the more than 70 percent of the world’s population yet to experience the benefits derived from broadband Internet access. How do we accelerate access as we move toward reaching the next billion users?

As with many things related to technology and communication, reaching the third billion is centered on the three major pillars of access, affordability, and awareness. Each country and situation calls for the development of unique, creative programs that can address these three elements successfully and meet the challenges of extending the reach and impact of broadband services.

THE IMPORTANCE OF INTERNET ACCESS: THE TIME FOR BROADBAND

In the past decade, almost 75 percent of the world’s population has obtained an unprecedented level of basic connectivity through the almost viral proliferation of mobile phone technology.² Fueling the vibrant images of mobile phones sold in rural marketplaces—alongside fruits, vegetables, and other necessities—has been the communication industry’s ability to reach new customers with creative and affordable service options. The most notable of these has been the prepaid phone service. In developing countries, prepaid voice services are the choice of most people,³ reaching up to 97 percent of the users in Africa—allowing virtually everyone to choose the level of communication they can afford while avoiding an ongoing commitment.

This ubiquity of affordable telecommunications has led to a wave of new and innovative services that go well beyond staying in touch with family or friends. Affordable voice and text connections have become business and economic enablers.

Table 1: Broadband speed comparisons: Time needed to download content at different connection speeds

Content	256 kilobits per second (kb/s)	2 megabits per second (Mb/s)	10 megabits per second (Mb/s)	100 megabits per second (Mb/s)
Google home pages (160 kb)	5 seconds	1 second	Instant	Instant
Music track (5 MB)	2 minutes, 36 seconds	20 seconds	4 seconds	Instant
Video clip (20 MB)	10 minutes, 25 seconds	1 minute, 20 seconds	16 seconds	2 seconds
CD / low-quality movie (200 MB)	6 hours, 4 minutes, 35 seconds	46 minutes, 40 seconds	9 minutes, 20 seconds	56 seconds
DVD / high-quality movie (4 GB)	34 hours, 43 minutes, 20 seconds	4 hours, 26 minutes, 40 seconds	53 minutes, 20 seconds	5 minutes, 20 seconds

Source: ITU calculations with rounded values.

Although the world has reason to marvel at the benefits achieved with this first wave of wireless communication options, a second wave is hovering in the wings, waiting to become a driver of even greater economic impact. In this second wave, broadband technologies are extending the opportunities offered by data communications. It is easy to visualize the music, video, and multimedia experiences extended by broadband communications along with the business and economic opportunities that broadband makes possible. This makes encouraging the rapid proliferation and adoption of broadband crucial to those attempting to enter a local, national, or global market.

This was clearly stated in a World Bank study:

Over the past decade, developing countries have seen rapid but uneven growth in information and communication technologies (ICT) access and use. Progress has been noteworthy in mobile telephony, where the gap between developing and developed countries is narrowing rapidly. . . . But outside mobile telephony, there are large and widening gaps in high-speed Internet access and Broadband connectivity, the development of local information technology (IT) industries, and of ICT applications; that is, the diffusion and use of ICT in business, services, and government—the areas where ICT can deliver the largest developmental impacts.⁴

Those charged with promoting the benefits of ICT and broadband can draw upon many examples. Research and implementations around the world have repeatedly shown that ICT investments can have a

positive impact on jobs, productivity, GDP growth, and innovation. The demonstrated effects of investment in the ICT infrastructure include:

1. the creation of high-skilled, high-paying jobs;
2. improved international competitiveness;
3. a spillover effect, which can create opportunities in many other industries;
4. a better quality of life through enhanced education, healthcare, and so on; and
5. stronger and more competitive small and medium businesses.

US Federal Communications Commission (FCC) Chairman Julius Genachowski highlights the impact of these effects, as reported in a recent Reuters article:

No infrastructure matters more for job creation and economic growth in the 21st century than broadband internet. . . . While the new “hyperconnected world” means some 20th century jobs may never return, Genachowski said studies show that broadband-related industries create 2.6 jobs for [every] one lost. He pointed to Facebook, which employs 2,600 people but has led to the creation of another 182,000 jobs. . . . And while eBay and Amazon employ 50,000 people, they provide a sales platform for up to 1 million entrepreneurs.⁵

Most countries are increasingly working hard to help their citizens adopt technology to improve their nation’s competitiveness. We consider several of these national efforts here.

Table 2: Data usage comparisons

Type of traffic	ENTRY-LEVEL USER 300 megabytes	STANDARD BUSINESS 1 gigabyte	HEAVY BUSINESS AND LEARNING 2 gigabytes	PERSONAL MEDIA USER 5 gigabytes
Basic email (20,000)	1,400 emails	2,500 emails	4,000 emails	2,000 emails
• With attachment (300,000)	• 100 emails	• 200 emails	• 300 emails	• 500 emails
• With photo (1 MB)	• 40 emails	• 100 emails	• 100 emails	• 300 emails
Web pages (300,000)	1,500 pages	2,000 pages	2,700 pages	5,500 pages
Social media with photos (500,000)	20	n/a	400 posts	10,000 posts
Streaming video (60 seconds = 3 MB)	n/a	1 hour	4 hours	10 hours
Application/game (download = 15 MB)	n/a	n/a	n/a	10 applications, 20 games
Music download	n/a	n/a	n/a	50 songs

Source: Example workloads are derived from AT&T workload data.

Notes: Data refer to the number of emails, web pages, and so on that a user "consumes" per month. n/a = nonapplicable.

In 2010, the Malaysian government spearheaded activities aimed at reaching 50 percent of households with personal computers (PCs) and Internet access. They are utilizing Universal Service Funds to subsidize 1 million netbooks for students and connectable rural low-income families and to establish projects to improve broadband coverage across specific underserved areas of the country.⁶ The program at launch targeted a 1 percent rise in GDP and the creation of 135,000 jobs.

Perhaps the most prominent government-driven program for broadband Internet access is Australia's National Broadband Network (NBN) project. Here the government has recognized the economic potential of high-speed Internet connectivity and is engaged in a project (costing 43 billion Australian dollars) to bring 100 Mb/s fiber to every Australian home and business. The program emphasized the inclusion of the country's more rural regions to ensure that all citizens have comparable access to the network. This forward-looking project recognizes the ever-increasing importance of connectivity to national competitiveness.

A recent article in *telecoms.com* highlighted research released by Arthur D. Little, Chalmers University of Technology, and Ericsson that shows that doubling broadband speed can yield growth in excess of 0.3 percent GDP and quadrupling broadband speed can yield 0.6 percent growth in GDP.⁷ They credit the positive effects of the increased speed to automated and simplified processes, increased productivity, and better access to basic services such as education and healthcare. The

study also showed that for every 10 percent increase in broadband penetration, a country's GDP increases by 1 percent.

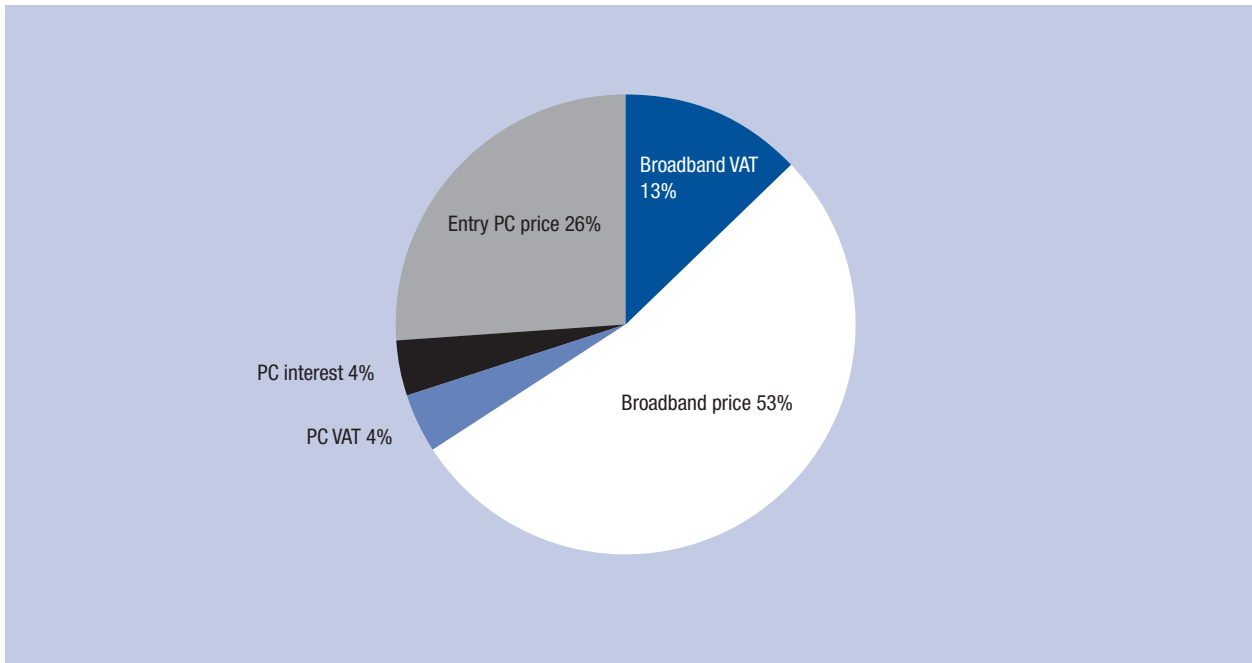
The anticipated traffic of a truly connected society will continue to require higher bandwidths. As noted in the Cisco® Visual Networking Index, "In 2010, 3 million tablets were connected to the mobile network, and each tablet generated 5 times more traffic than the average smart phone. In 2010, mobile data traffic per tablet was 405 MB per month, compared to 79 MB per month per smart phone. There were 94 million laptops on the mobile network in 2010, and each laptop generated 22 times more traffic than the average smart phone" and 515 times the traffic of a regular "not so smart" phone.⁸

Table 1 provides some clarity on what different throughputs could mean in terms of the user experience (wait time).

It is important to determine what size is required for a data plan to be adequate for an individual to be able to participate in global and/or local business environments. The AT&T calculator helps calculate how much service is needed based on expected utilization (see Table 2).⁹

The example workloads in Table 2 indicate what might be possible at different download quantities. It is important to note that a satisfactory level of communication can be obtained from lower-volume data plans. Heavier use of richer media is, however, relegated to higher-volume plans.

Around the world, countries have been recognizing the need for high-speed Internet to be available to every

Figure 1: Average personal computer plus broadband solution costs, BRIC+TIM countries

Source: ITU, 2010a.

Note: Data projected for next four years (based on current day).

citizen, even in the most remote areas. They are deploying internal fiber networks, licensing spectrum, and using Universal Service Funds and other financial vehicles to support the efforts of providing affordable ubiquitous Internet access to their constituents. Like the progress experienced with the innovative use of voice and text services enabling supply lines with previously unobtainable knowledge, affordable broadband connections are fast becoming the business and economic enablers that make possible business and customer service opportunities previously too difficult to coordinate.

AFFORDABILITY: MAKING THE EXPENSIVE AFFORDABLE TO THE NEXT WAVE OF USERS

Recent studies published by ITU reveal that broadband penetration is directly related to its cost, relative to an average family income, as well as to the availability of products and services that accommodate the general population's purchasing ability.¹⁰ For example, as the annual cost of broadband drops below 3 percent of a family's annual income, its use begins to increase dramatically. For developed countries, this relative cost has already been achieved, but for at least 34 countries worldwide, the cost of broadband remains higher than the average annual family income and thus it remains entirely out of reach.

Extending the penetration of broadband to reach the next billion users becomes more complex because the ability of people in developing countries to afford more advanced technology and communications lessens dramatically. Of the approximately 5 billion people worldwide who remain without broadband access, the third

billion represents those poised or preparing to achieve an income level capable of technology consumption. The challenge becomes one of establishing viable models that make this possible.

Affordable broadband programs are starting to emerge in countries such as Sri Lanka and India, with service providers offering connectivity solutions starting as low as US\$2 per month. This level of affordability is making it possible for people to step up their learning, skills preparation, and service delivery levels by opening up their access to a larger quantity of Internet services and PC applications. Internet access services, coupled with computing devices that can range from entry-level netbooks to higher-performing laptops, are having a positive impact in these communities while providing choice. Many of the offerings are linked to financing options that further reduce the entry barriers to lower-income Internet entrants.

Those working hard to bridge the digital divide have tried to reduce these costs and barriers to entry for new users. Significant focus is put on the cost of specific Internet access devices, especially PCs, but looking into the total cost of ownership for a citizen of the rapidly developing economies—BRIC+TIM countries¹¹—(Figure 1) shows that most of the family / individual income invested in getting connected to the Internet is actually spent on connectivity.

Some governments have realized that incentivizing technology adoption is much more lucrative than overtaxing the initial technology purchase. This realization has resulted in reducing the cost of devices through

Figure 2: Three percent of family income: Entry point for broadband adoption



Source: Intel calculations based on Euromonitor statistical data and Intel field intelligence.

subsidies and reducing or removing some of the taxes such as import duties and value-added tax (VAT).

For instance, Turkey's temporary VAT reductions have proven very effective in this regard.¹² By examining its economic data,¹³ the Turkish government determined that a reduction on the VAT on PCs would have significant benefit. TUBISAD, a local nongovernmental organization, pointed out an important reason for the government to expand its consideration to the ICT industry: on average, in Turkey it takes US\$61,000 to create a new job in a traditional sector such as the auto industry, compared with just US\$5,000 for a new job in the ICT sector. Turkey's ICT economic model projected that:¹⁴

1. a 10 percentage point reduction on VAT would increase PC sales by 10.3 percent;
2. the tax reduction program has a net present value of US\$279 million over a five-year period;
3. the VAT reduction would lead to an additional 14,000 to 15,000 jobs in PC manufacturing and retailing industries over a five-year period, and
4. each dollar lost on VAT revenue returns US\$1.31 to the government in other taxes.

In the end, the Turkish government provided US\$100 million in financial support to small and medium businesses for ICT purchases, in addition to reducing the VAT on PCs from 18 percent to 8 percent for three months. In the three months after the VAT was reduced, the benefits predicted by the ICT economic model were evident, and included:

1. increased nominal tax revenue for the government;
2. increased demand for ICT-related purchases caused by a favorable public response to the VAT reductions; and
3. greater local PC production, which increased 4.3 percent in April 2009.

Shortly after the initial three-month period expired, the policy's success convinced the government to extend the VAT reduction an additional three months.

Turkey's ICT economic model is now being used to evaluate other stimulus-program options such as providing cash rebates to first-time PC buyers and subsidizing the cost of broadband for PCs purchased by teachers.

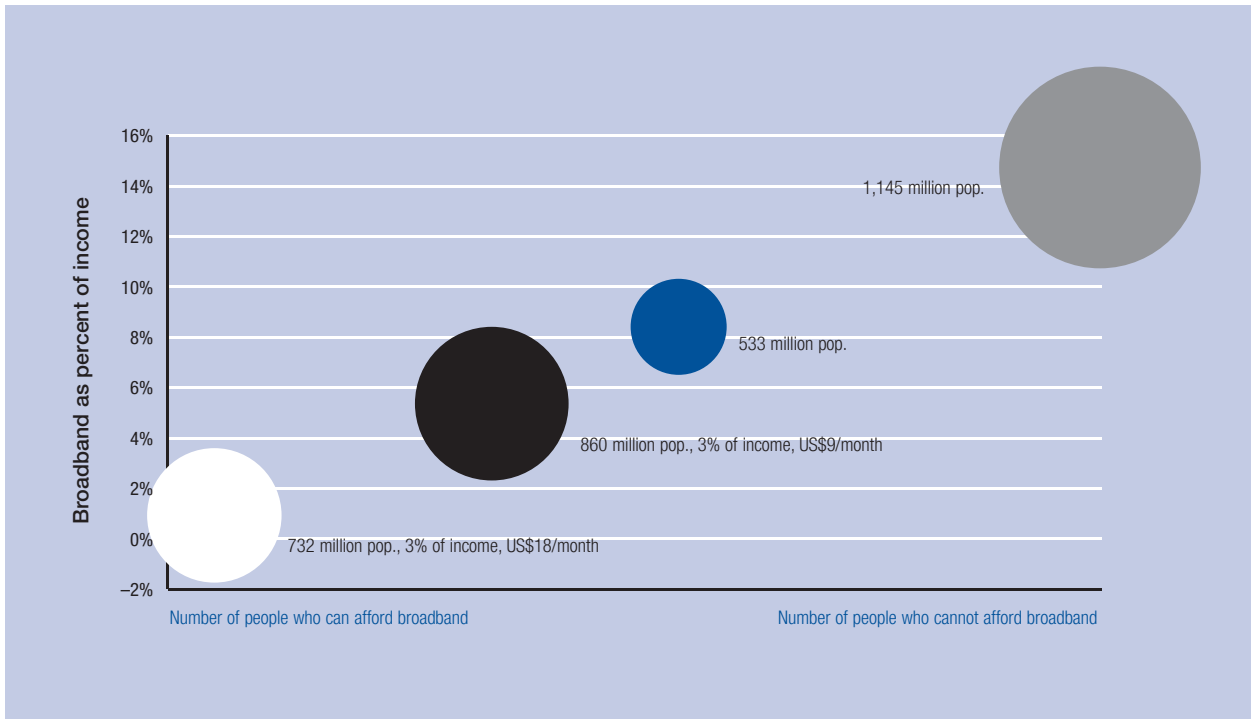
IS AFFORDABLE BROADBAND INTERNET ACCESS A VIABLE BUSINESS?

Frequently, employing successful models for increasing broadband utilization requires identifying how to maintain telecommunications service provider solvency while adding a large volume of new users.

As noted earlier, broadband becomes affordable to a substantially larger percentage of the population when it approaches 3 percent of annual family income. A large percentage of developing and emerging nations find themselves in between (Figure 2).

As seen in Figure 3 and Table 3, Brazil, Russia, India, China, Turkey, Indonesia, and Mexico (BRIC+TIM countries) could grow their available market by 860 million people by reducing the cost of entry for broadband

Figure 3: Affordability levels



Source: Intel calculations based on Euromonitor statistical data and Intel field intelligence.
 Note: BRIC+TIM countries have 50 percent of the world's population; 80 percent of those in BRIC+TIM countries cannot afford broadband at the 3 percent GNI PPP income threshold.

Table 3: Affordability levels

Broadband as a percent of GNI PPP per capita	Population that can afford (millions)	Percent of population
< 3	731,911	22.38
>3 - <6	860,138	26.30
> 6 - < 10	533,277	16.31
> 10 - < 40	1,145,132	35.01
	3,270,458*	

Source: Intel calculations based on Euromonitor statistical data and Intel field intelligence.
 Note: BRIC+TIM countries have 50 percent of the world's population; 80 percent of those in BRIC+TIM countries cannot afford broadband at the 3 percent GNI PPP income threshold.

by about 50 percent. Short of dropping prices, lower-cost and lower-speed or prepaid data packages can allow broadband providers to find new avenues to new customers by reducing the barrier to broadband adoption.

From a business perspective, a high-level calculation can approximate the potential business opportunity for a whole industry in terms of revenue and GDP growth: 1 billion new users x US\$10/month x 12 months can represent up to US\$120 billion revenue per year of opportunity over the course of the next several years.

Well-managed use of prepaid and capped offerings is enabling people to benefit from Internet access

at lower speeds and cost entry points. Creative approaches to obtaining large quantities of data—such as pre-loading content on devices, utilizing free public Internet access, and transporting data via USB storage and other portable memory devices—can facilitate using lower speeds and cost entry point plans with experiences, learning content, and applications comparable to higher bandwidth options.

Telecommunications companies, governments, and vendors of technology are starting to understand the opportunities of reaching the third billion. Affordable data plans are beginning to emerge. Affordable connectivity bundled with computers, software, and content are being offered by several service providers around the world. Government-sponsored programs to equip educators, students, and lower-income families are also becoming a priority for many countries.

To take the example of Kenya, family income levels mean that only about 7 percent of the population can afford a service that offers uncapped monthly broadband access for US\$20 per month. A prepaid broadband access service capped at 200 MB of data for US\$5, however, could be within the reach of more than 60 percent of the Kenyan population. Realizing these affordability levels, Safaricom, the largest Internet service provider in Kenya, launched a segmented prepaid broadband offer in the end of 2009 targeted at different income levels. With most new broadband users also needing to acquire a PC, the PC market grew in the country as

well: in 2010, the Kenyan PC market grew more than 100 percent (compared with 2009) versus an average PC market growth in Africa of only 3 percent, according to International Data Corporation (IDC) period Q1'10–Q1'11.

In Egypt the telecommunications provider Mobinil is currently offering a netbook with six months of Internet access for US\$300.¹⁵ The broadband service is capped at 110 MB per month, at which time the high-speed service degrades. The service can be upgraded at various increments to a high-speed data package of 1.5 gigabytes (GB) for approximately US\$8.50, so a large majority of the population can thus afford to be connected.

In many cases, although affordable offerings become available, those who could benefit most are not aware of this opportunity. The challenge becomes finding new ways to reach the new customers with new value propositions.

AWARENESS: PROMOTING BROADBAND ACCESS

Making new customers aware of the value and availability of broadband services can be difficult, and different approaches are being deployed by service providers to reach customers. Government programs as well as private ones are helping telecommunications providers and other technology vendors reach beyond their traditional marketing and sales promotions.

Learning from modeling and other economic data, many countries—including Australia, Brazil, Portugal, and Turkey—have made strategic investments in the ICT industry. These investments are designed to create new jobs, increase revenue for the government, and provide more stable overall economies.

In 2007, the government in Portugal launched a national program called Magalhães (Magellan) to provide subsidized laptops with 3G connectivity to all secondary students and teachers in the country using funds from the auction of 3G licenses. In 2008 this initiative was extended to primary school students, and it reached more than 1.3 million students and teachers over a period of three years. The cost of broadband was as low as 5 euros for 2 GB of data per month (with a 36-month contract) and laptops including an external 3G USB modem, commonly known as 3G USB dongle, would cost a maximum of 150 euros.¹⁶ This program was widely marketed and publicized both by the government and private partners, thus ensuring that the entire society was aware of the program, its benefits, and the conditions under which one is eligible. The outcome was clear: two years after the start of the program, most of the students and teachers in Portugal had acquired their own laptops.

Vietnam's PC for Life program provides a good example of an extensive public-private partnership where a well-articulated communications campaign is reaching a large proportion of the population.¹⁷ The government teamed up with telecommunications companies, computer vendors, content providers (including those

providing English-learning software), and bank financing options, combining these various functions into multiple waves of programs. The fixed broadband packages from VNPT, which is running the program, include free installation; special pricing for students and teachers starts at US\$4.30/month instead of the standard US\$10/month. The Vietnamese mobile operator Viettel is offering a 3G data plan starting at US\$6/month for unlimited data as well as a free service capped at 500 MB for students aged 14 to 22. The bundles offer choices of entry-level and higher-end laptops and netbook devices as well as add-ons from a variety of companies. The program has a strong national marketing campaign complete with songs and icons. Consistent with participants in other programs that provide several options, those offered different choices by Vietnam's PC for Life program typically stretch to try to buy the best capabilities they can afford.

Argentina's Conectar Igualdad program has chosen a different approach and is actively promoting the nation's rollout of PCs in their schools.¹⁸ The nation is in the middle of a massive rollout of 3 million computers with the aim of providing a computer for all secondary school students and teachers. They have established a website and links through social networking sites that enable all citizens to watch and experience the rollout: <http://www.conectarigualdad.gob.ar/>. The program has established technology as part of the country's educational system, and includes courses, teacher training, learning content, and services as well as security. The computers can function both at school and outside the classroom. Broadband connectivity is provided in the schools.

Many other countries are starting to follow suit, identifying the results they want to achieve by including broadband in their ICT investment. The most successful programs clearly define their objectives and broadly communicate their existence to civil society.

THE EXAMPLE OF SRI LANKA

To illustrate what such a program could look like, we look at Sri Lanka's stated objectives, extracted directly from the *Information and Communication Technology Plan for Sri Lanka 2011–2016*:¹⁹

The following economic and social targets will mainly be focused at in the initial stage:

- a. Drive ICT industry up to the level of US\$1.0 billion industry by 2016 (US\$2.0 billion industry by 2020)
- b. Create 100,000 new employment related to ICT industry and ICT enabled industries by 2016 (250,000 new employment by 2020)
- c. Increase level of ICT literacy up to 75% by 2016

- d. Facilitate the use of ICT by citizens for fulfilling the needs of everyday life
- e. Promote ICT education and Human Resources Development and ensure quality and standard of ICT education and training
- f. Ensure availability of high quality and standard ICT Hardware and use of quality and legitimate software
- g. Increase availability and use of high speed Broadband and network connectivity for economic and social activities
- h. Strengthen the legal framework, provide secure environment for use of ICT and control computer crimes

Further, the Government has realized that the promotion of ICT usage in all business and industries would result in significant enhancement of the competitiveness of Sri Lanka over the other countries in the region. Presently, there are internationally accepted indexes set out by agencies functioning under the United Nations and other reputed global institutions to measure the relative advantages of a country over other countries of the world. Rising up in the ladder of indexes is one of the best approaches to attract more investments which would pave the way for more employment opportunities, better quality of life and finally rapid economic growth of the country. Therefore, it is expected to achieve minimum 20–30% growth related to the following globally accepted indexes during the next six years by injecting ICT into business, industry and the public sector.

- a. eGovernment Readiness Index
(Rank: 111 out of 192 countries in 2010)
- b. Network Readiness Index
(Rank: 72 out of 133 countries in 2009-10)
- c. Global Competitiveness Index
(Rank: 62 out of 139 countries in 2010-11)
- d. Ease of Doing Business Index
(Rank: 102 out of 183 countries in 2010-11)

The process of implementation of the plan will be fundamentally based on Government's leadership, commitment of resources and smart partnerships. Furthermore, it is essential to have the collaboration of citizens, Government and the private sector to achieve the objectives of this plan.

The Sri Lankan plan has its roots in several successful years of proactive stimulus. Since 2009, the country has reduced its taxation of ICT products and services. As a consequence, broadband adoption has been growing at a rate of 100 percent year over year. In practical terms, the number of people capable of affording broadband went from approximately 3.5 million to over 13 million in 18 months. The availability of prepaid offerings that cost approximately US\$2 per 300 MB was a principal method of making broadband more affordable.

Different countries have different priorities; some governments have decided to focus on specific segments of the population, such as teachers or students. All programs, however, employ one or more of the access, affordability, and awareness catalysts mentioned previously to establish their momentum. We consider two additional examples to see how this comes together.

Through South Africa's Teacher Laptop Initiative, a program managed by the country's Education Labour Relations Council, "Qualifying teachers will receive a monthly allowance of 130 South African Rands (R130.00) (taxable) and are required to fund the difference between the allowance (R130.00) and the monthly repayments of the package. Most of the packages from the provisionally accredited suppliers cost between R250.00 and R390.00 per month. The repayments are spread over a period of five years. The packages consist of appropriate hardware with prescribed minimum specifications, school administration, national curriculum and other software, as well as Internet connectivity, insurance, and finance. . . ."20

In Kenya, according to the country's ICT Board, "The laptop initiative is funded by the World Bank and implemented by The Kenya ICT Board under the Kenya Transparency and Communications Infrastructure Project (TCIP), as part of a component to implement the Computers for the Communities Initiative. This laptop initiative is known as 'Wezesha'; a Swahili word that means 'to enable'. . . . The incentive per registered student will be approximately fifteen (15%) and thirty three (33%) percent of the actual price of a laptop, depending on whether the student will prefer a lower-end or higher-end model."21

CONCLUSION

We can enjoy and applaud the success of some of the programs noted above for reaching a significant percentage of their country's population. However, many countries have yet to incorporate affordable broadband strategies as part of their national growth plans, and many telecommunications companies have not yet realized the potential of establishing new program offerings that can significantly extend their business by reaching a much broader customer base.

Exploring programs that actively address the issue of broadband adoption as an enabler of national progress, we find three principal mechanisms or channels that prove consistently useful:

1. telecommunications providers willing to package and market prepaid and subscription (post-paid) broadband offerings with limited speed or data packages at a lower cost;
2. an excited local ecosystem offering creative, affordable bundles and/or financing; and
3. government and regulatory incentives, sponsorship, and alignment to national broadband and overall ICT objectives.

The third billion represents the next wave of the world's population that is close to being able to afford Internet connectivity through a PC. Creative approaches to making technology and connectivity solutions affordable and accessible are starting to facilitate these people's capacity to contribute to and benefit from economic growth.

Fortunately, those tasked with improving the market penetration of broadband can benefit from the success of prepaid voice services. Utilizing the same, or similar, business models, government and private industry leaders are starting to see the value, as well as the necessity, of finding ways to bring more and more of the population into the information age. Developing programs that reduce the cost of access through tax reductions, prepaid services, creative financing, and entry-level offerings that approach 3 percent of a family's annual income can have a tremendous impact, more than doubling the population contributing to the economy by utilizing and innovating with ICT.

NOTES

- 1 ITU 2010a.
- 2 ITU 2010a.
- 3 Wireless Intelligence 2011.
- 4 IEG 2011.
- 5 Voskamp 2011.
- 6 *Universal Service Funds*, also called *Universal Service Access Funds*, are the funds that governments collect as a tax from telecommunications operators to whom they have allocated spectrum, with the goal of making supporting investments in infrastructure and access to voice and data in the parts of the country where commercial operators would not be able to justify a sustainable business model.
- 7 Middleton 2011.
- 8 Cisco 2011.
- 9 See <http://www.att.com/standalone/data-calculator/>.
- 10 ITU 2010a.
- 11 BRIC+TIM is the acronym that represents Brazil, Russia, India, China plus Turkey, Indonesia, Mexico.
- 12 Intel 2009a.
- 13 Today's Zaman 2009.

- 14 Intel 2009b.
- 15 See the company's promotional website at <http://www.mobinil.com/whatsnew/BuySamsungnetbookN150withMobinilUSBmodem.aspx>.
- 16 Information about the Portuguese Magalhães program is available at www.e-escola.pt.
- 17 Information about the Vietnamese PC for Life program is available at <http://www.pcguides.vn/pc4life/>.
- 18 Information about Argentina's Conectar Igualdad program is available at <http://www.conectarigualdad.gob.ar/>.
- 19 Ministry of Telecommunication and Information Technology (Sri Lanka) 2011.
- 20 Information about this program is available at <http://www.teacher-laptop.co.za/#>.
- 21 Kenya ICT Board 2010.

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