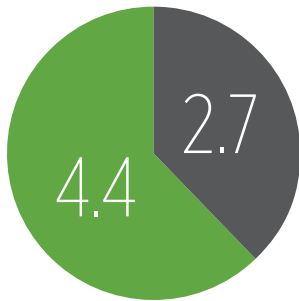**Cambium Networks™**

Global Connectivity: The Road Ahead for The Under-connected and The Unconnected

2013 GLOBAL INTERNET CONNECTIVITY

2.7

4.4

● Billions of people Connected

● Billions of people Unconnected

> "... The power of a connected and enlightened world community is just beginning."

HECTOR RUIZ, CHAIRMAN AND CEO, ADVANCED NANOTECHNOLOGY SOLUTIONS INC.

90% OF THE 1.1 BILLION HOUSEHOLDS WITHOUT INTERNET ACCESS ARE IN DEVELOPING COUNTRIES

% OF PEOPLE WITH INTERNET ACCESS

77
Developed communities

30
Emerging communities

X3 The average cost of a fixed broadband subscription in Africa is almost three times the per capita income

> "... Doubling the digitization level at the bottom of the pyramid ... lift[s] more than half a billion people out of poverty."[1]

Digitization boosted world economic output by nearly $200 billion and created six million jobs in 2011.

It would cost India $5 billion to digitize its 1,068,073,612 people lacking Internet access.

INTERNET COMMUNICATIONS ARE CHANGING THE WORLD AND THE JOURNEY ISN'T CLOSE TO BEING FINISHED. By the end of 2013, 2.7 billion people, or about 40% of the world's population, will have Internet connectivity. That still leaves 4.4 billion people unconnected.[2] The challenge is not simply about billions of people not having access to the Internet – it's in understanding the problem from the perspective of communities without any Internet access (the unconnected) and those of communities with only basic connectivity (the under-connected). Offering these two distinct populations access to the social, business, healthcare, government and educational resources and opportunities the Internet offers can help them play their own roles in changing the world.

> Technology is only as powerful as it is accessible. Broader access brings education, information and a sense of community ... The power of a connected and enlightened world community is just beginning."

HECTOR RUIZ, CHAIRMAN AND CEO, ADVANCED NANOTECHNOLOGY SOLUTIONS INC.

Global Impact

The global impact of this lack of connectivity is apparent in another set of figures. In developed countries, almost 77% of people have connectivity, but in emerging communities, only about 30% of the population has Internet access.[3] As emerging communities strive to make their way in the global economy, lack of access to information and communication technologies (ICT) is clearly holding them back. The reality is that more than 90% of the 1.1 billion households without Internet access are in developing countries.[4] This dearth of connectivity is a major contributor to the still large disparity between the "haves" and the "have nots" around the world.
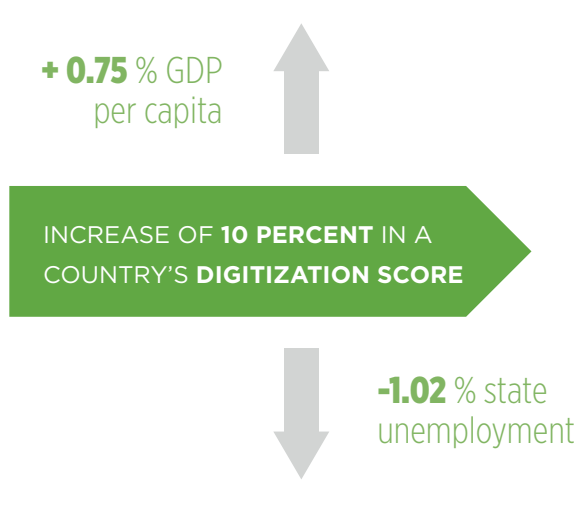
> Digitization—the mass adoption of connected digital services by consumers, enterprises, and governments—is a fundamental driver of economic growth and job creation the world over—in both developed and emerging markets."

WORLD ECONOMIC FORUM, GLOBAL INFORMATION TECHNOLOGY REPORT, 2013

## Digitization Promotes Economic and Societal Growth

A country's digitization score is a direct corollary to economic growth. Per a Booz & Company report, digitization scores are rendered based on six attributes: ubiquity, reliability, affordability, speed and usability of digital services offered to consumers and enterprises, and skill, the ability of users to incorporate digital services into their lives and businesses.[5] In its Global Information Technology Report for 2013, the World Economic Forum states that "an increase of 10 percent in a country's digitization score drives a 0.75 percent growth in its GDP per capita. That same 10 percent boost in

digitization leads to a 1.02 percent drop in a state's unemployment rate."[6] The report also notes that despite global economic difficulties, "digitization boosted world economic output by nearly $200 billion and created six million jobs in 2011." Another Booz report revealed that "doubling the digitization level at the bottom of the pyramid in emerging economies over the next 10 years could produce $4.4 trillion in additional nominal GDP and 64 million new jobs, and lift more than half a billion people out of poverty."[7] The Internet is proving to be a significant driver of personal and economic growth in the poorest corners of the world.

+ 0.75 % GDP
per capita

INCREASE OF **10 PERCENT** IN A
COUNTRY'S **DIGITIZATION SCORE**

-1.02 % state
unemployment

**SIX MILLION JOBS
CREATED IN 2011**

In addition to research revealing the Internet's positive impact on lives from technological, economical, healthcare and social perspectives,[8] there are also great returns awaiting the companies providing those services. For financial, healthcare and education institutions, it is often cost prohibitive to serve people living far from hubs of high-speed and quality connectivity. It is estimated that for the healthcare and education industries alone, a $700 billion dollar opportunity awaits when the unconnected can access the digital world.[9]

Of additional note is Internet connectivity's correlation to a country's level of innovation score as measured by patents and even happiness.[10]
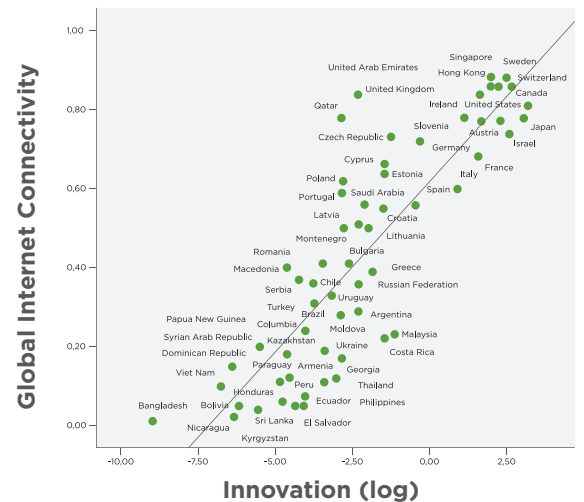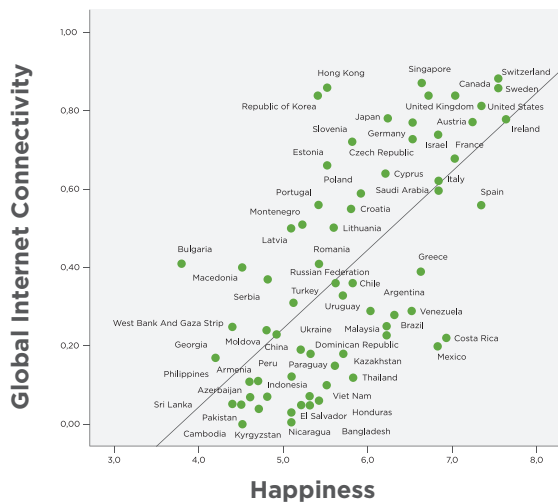
What's Holding Increased Access Back?

This is hardly new insight; the extraordinary power of Internet connectivity has been acknowledged for some time now alongside the concept of the "digital divide." Despite this understanding, connectivity gaps do not seem to be shrinking as quickly as they should. The key challenges in establishing connectivity and realizing its benefits are different for the unconnected, those who have no access to the Internet, and the under-connected, those who have basic connectivity.

While recognizing that these communities have a host of realities far more pressing than accessing the Internet – lack of reliable electricity, for one – we're focusing on the two main issues that the unconnected and the under-connected face in joining the digital world.
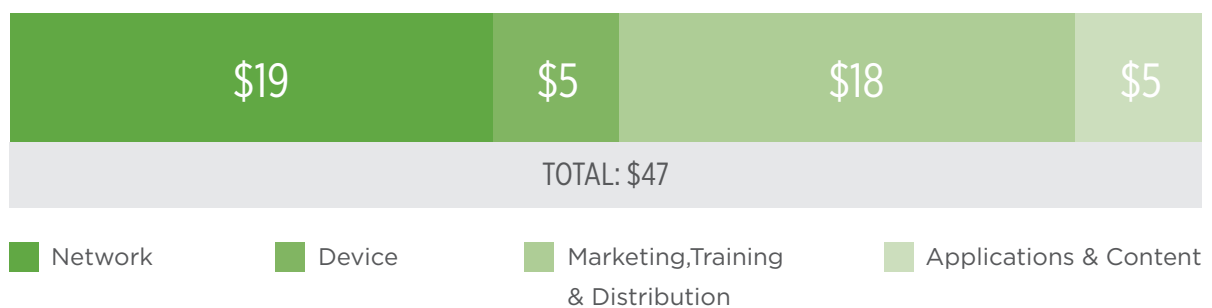
The Unconnected: Expense

As might be expected, the major issue standing in the way of providing increased global connectivity for the unconnected is expense. From a 2012 UN Report[11]: "Although the cost of ICT services has been decreasing, they remain much higher in developing than in developed countries ... The average cost of a fixed broadband subscription in Africa is almost three times the per capita income. In developed countries, however, the average cost per user is less than 2 percent of per capita income."

Moreover, the cost of digitizing this community, which includes building networks, procuring devices, training local populations to use and distribute the technology, and writing applications and content relevant to them, is steep.

By the $47 cost of digitization per person below, it would cost Djibouti $33.5 million to digitize its 713,069[12] people lacking Internet access. It would cost India $5 billion to digitize its 1,068,073,612[13] people lacking Internet access.

Cost In U.S. Dollars Per Capita, Annually

$19	$5	$18	$5
TOTAL: $47			

■ Network   ■ Device   ■ Marketing,Training & Distribution   ■ Applications & Content

The Under-Connected: Barriers To Better Connectivity

For the under-connected, broadband access provided by new affordable networks limits them to very basic connectivity, and cannot fully propel them into the digital economy. There's no question that some access is better than no access. But the new affordable networks are often proving to be problematic and frustrating in a number of ways. In the typically harsh environments of rural, mountainous and remote locations, there are serious reliability issues. Difficult RF challenges, such as terrain, foliage, water, buildings and other obstacles, can cause service delays and equipment

failures that are expensive and time-consuming to investigate and repair. Just as important, network performance levels tend to be inconsistent.

Today's affordable networks allow for basic applications like e-mail, but the high-speed Internet connections required for video-on-demand for hospitals and schools – services that would really help developing communities break the poverty cycle – are too expensive. This is true worldwide, even in some countries with advanced digitization scores such as the U.S.[14] and Canada.[15] It follows that the same economics issue is felt much more acutely in developing communities. The equipment needed to provide connectivity has historically been costly as well, even for wireless solutions, and its installation can be high in remote locations and challenging terrain.

> "[T]he landscape of communications is changing dramatically. Being connected will not just be about having phone and perhaps Internet service. It will mean broadband delivery of increasingly converging services such as interactive voice, data and full motion video."
>
> **WILLIAM KENNARD, FORMER FCC CHAIRMAN**

Encouraging News: Next-Generation Affordable Broadband

The world's service providers and end users are about to be introduced to the next generation of affordable wireless broadband technology. For subscribers, the new technology provides an experience far exceeding current affordable solutions. The new technology will present the first affordable wireless architecture, combining exceptional reliability and superior performance. This breakthrough solution will enable meaningful use for subscribers in hard-to-serve rural and remote regions. Finally, these communities will be able to more effectively utilize today's growing portfolio of bandwidth-intensive applications for economic, personal and social gain.

For service providers, next generation affordability offers the tools that will help them build expandable, sustainable and profitable business models for connecting the under- and unconnected. These tools include GPS synchronization to minimize interference and enable scalability; enhanced reliability to save time and decrease operational expenditures; QoS for guaranteed voice and video transmission; Line of Sight (LOS) and near Line of Sight (nLOS) connectivity; and the ability to support today's and tomorrow's bandwidth-intensive and latency-sensitive applications.

> "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."
>
> **WORLD ECONOMIC FORUM, GLOBAL INFORMATION TECHNOLOGY REPORT, 2012**

Changing The World Becomes Good Business

The new generation of affordable wireless broadband technologies represents a paradigm shift for entrepreneurs in developing countries. Increased network performance and reliability enable them to serve the unconnected and under-connected with more than basic connectivity. They enable meaningful use solutions that can ultimately help create jobs, build more cohesive communities and pave the way for stronger economic and social growth in these remote areas.

For service providers themselves, these new affordable wireless technologies make it possible to make more money. They are the catalyst for creating what's clearly been missing in affordable broadband – the creation and implementation of expandable, sustainable and profitable business models.

About Cambium Networks

As the global leader in wireless point-to-point (PTP) and point-to-multipoint (PMP) network technology, Cambium Networks is dedicated to making it possible for Internet service providers to build sustainable businesses by connecting the under-connected and unconnected communities of the world. Our industry-leading portfolio of products offers communications solutions that make it feasible and economical to unite the world and build a truly global society that leaves no one behind. At Cambium Networks, connecting the unconnected is our vision.

"

For a decade, we have been developing and installing our proven technology in communities in need of reliable, scalable and high-quality connectivity. We have expertise in regions that have never been connected before, and know the 4.4 billion unconnected won't be so for much longer."

ATUL BHATNAGAR, CEO, CAMBIUM NETWORKS

Notes

1 Booz & Company. (2012). *Digitization in Emerging Economies: Unleashing Opportunities at the Bottom of the Pyramid.* Available from http://www.booz.com/

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