Powering Intelligent Connectivity with Global Collaboration

Mapping your transformation into a digital economy with GCI 2019

Presented by Huawei
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Executive Summary

The economic success and productivity gains made possible by digital transformation depend on investment in ICT infrastructure, a fact that’s not lost on policymakers or industry leaders. However, it isn’t just a case of flexing financial muscle and throwing investment at tech projects – guided investment is necessary to forge a strong digital economy that reflects current economic and technological realities. Investing effectively requires an understanding of how ICT maturity influences productivity, a knowledge of where the tipping points for growth sit, and an insight into national ICT of how ICT maturity influences productivity, current economic and technological realities.

Underpinned by the emergence of AI, Intelligent Connectivity is shaping a future where everything is beginning to act, react, and collaborate wirelessly and seamlessly with human preferences, commands, and intentions. In this future, we believe that everything will be sensing, connected, and intelligent.

GCI 2019 also considers what we call AI’s Upside Potential – the potential growth that AI can realize for GDP, and one which has led us to expand our scoring parameters for GCI. New to this year’s report is Ecosystem Stakeholders. Reflecting the rise of the cross-border collaboration that’s shaping the global economic ecosystem, we’ve identified five stakeholder roles that underpin the digital economy and enable Intelligent Connectivity.

The future is not guaranteed and change is never easy, especially when set against the sluggish economic outlook that’s predicted for 2019 and 2020. It will take investment, infrastructure, data, and determination. It will take forethought. And it will take an understanding of how to plan ICT strategies based on the convergence of emerging technologies.

GCI 2019 identifies several inflection points where rising GCI scores can potentially trigger higher economic growth.

Intelligent Connectivity

We expect that nations crossing the GCI 65 tipping point with a focus on AI will see more than 1% of potential value added to their GDP growth, marking a significant breakthrough for Frontrunner economies against a backdrop of several years of sluggish growth after having reached the maximum value-add of previous ICT investment.

While many Starters and Adopters lack the ICT infrastructure to fully benefit from deploying AI, it should still be a focus of policymakers’ long-term strategy. Broadband connectivity is more important than ever, because distributed computing and the processing capabilities of cloud intelligence reduce the need for local data centers and computing infrastructure, instead requiring access to remote resources. Governments and industry leaders in Starter and Adopter nations should prioritize work on national-level Intelligent Connectivity and AI initiatives to accelerate access to these technologies.

GCI 2019 also finds that when a nation’s cloud readiness and IoT readiness scores cross the 50 and 40 mark respectively, AI’s impact on their economy begins scaling up. Simply put, a country is required to achieve an IT spend of between 3-4% of GDP to achieve the cloud and IoT readiness levels to reach the tipping point for AI to take off.

As a touchstone of AI readiness, cloud provides the data storage and computational capabilities required by AI. Another precondition for AI readiness is a strong installed base of IoT, which collects and creates the massive datasets that AI systems need to develop insights and expand their capabilities for machine learning.

Adopter nations should prioritize work on China’s 5G roll out. Adequate investment in ICT and related infrastructure, data, and determination are discovering an upside potential to AI that will boost GDP growth when AI is deployed in industries and organizations.

Countries with the highest GCI scores can leverage Intelligent Connectivity to accelerate economic growth up to 2.4 times faster than other nations for every point of GCI improvement.

However, even GCI Frontrunners are relative beginners in the Intelligent Connectivity arena, as they’re still learning how to develop, deploy, and train AI to solve real-world challenges. Cloud-based AI is in fact creating more of a level-playing field for Adopters and even Starters to reap the benefits of Intelligent Connectivity, with AI’s upside potential more evenly distributed across regions and industries.

5G’s rapid rollout will create new economic growth

If the introduction of 5G follows the patterns of previous wireless networks, we can expect a spike in global growth. With each new wireless generation, businesses worldwide have quickly taken advantage of the improved broadband experience to launch new products and services, optimize operations, and boost productivity. Typically, growth from a new-generation wireless network kicks in when global market penetration reaches 10%. However, while it took seven years for 3G to reach 10% of the global market and six years for 4G, we expect 5G to reach the 10% tipping point in four years.

5G starts with a key advantage: more than 40 5G-ready devices, mostly smartphones, will be on the market in 2019. 5G semiconductors and routers are also available today, well in advance of 5G’s network maturity and availability.
Ecosystem stakeholders drive collaboration

In an increasingly connected world, success will depend on the ability to collaborate. Intelligent Connectivity and other new technologies are making a global ecosystem possible that will see millions of partners across industries and nations collaborate to create sustainable socioeconomic development.

Intelligent Connectivity ecosystems employing AI, cloud services, and IoT will thrive with the growth in volume and quality of the structured and unstructured data that becomes available. Intelligent Connectivity can then deliver high-quality personalized products and services that engage more users, and in turn increase the quality and abundance of data, thus creating a virtuous cycle.

GCI 2019 identifies five stakeholder roles that can collaborate across domains, break down organizational silos, and deliver fast results to customers: Decision Makers, Data Scientists, Data Collectors, ICT Companies, and End Users. Understanding how to participate and leverage the strengths of these collaborative stakeholders is crucial for policymakers and industry leaders to deliver sustainable growth for their country or organization, especially as the influence of Intelligent Connectivity expands.

GCI 2019 also finds that nations that closely work with other trading country partners have a higher chance to reap the greatest benefits of Intelligent Connectivity, as local, regional, and certainly global ecosystems are increasingly reliant on cross-industry and national collaboration to create value for all participants; i.e., nations, enterprises, and the public.

Intelligent Connectivity as a force for all

This year’s report also covered social impact. We realized that Intelligent Connectivity is not only being recognized as a force for economic growth but may be the answer to many of society’s most complicated and deeply rooted challenges, including the wealth gap between rich and poor, inclusive development, environmental conservation, and climate change. Technology is an intrinsic part of today’s world. However, it shouldn’t be available only to those who can afford it. We look forward to policy makers and industry leaders increasing efforts to make technology, applications, and skills accessible to everyone, and bringing digital technology to every individual, home and organization.

The rise of Intelligent Connectivity marks a critical point of acceleration in the global digital transformation that the GCI has tracked for five years. ICT is already having a strong economic impact across countries and regions in every stage of development. While still in its infancy, Intelligent Connectivity’s ability to boost productivity, spur innovation, and accelerate the development of new business models will affect virtually every aspect of socioeconomic development in ways yet to be imagined.
The Global Connectivity Index tracks the relationship of ICT infrastructure investment and economic growth to provide policymakers with a view of the trends and information they need for sound decision-making. GCI 2019’s research methodology has been expanded to better reflect the emergence of AI and Intelligent Connectivity and to explain the technologies that we believe will drive economic growth in the near future.

GCI 2019 follows the digital development of 79 countries, with each assigned a GCI score ranking it along an S-curve graph. Countries on the S-curve are grouped into three clusters – Starters, Adopters and Frontrunners – according to their level of ICT investment, maturity, and economic development. Thanks to the expanded scope of the methodology, GCI 2019 showcases AI’s influence on GDP growth, which is particularly important for policymakers in advanced economies who have seen growth slow as they have squeezed most of the available digital dividends from their ICT investment in recent years. In the next chapter, “Economic Impact”, we will explain why the Frontrunner nations view AI as a powerful driver enabling them to resume or accelerate economic growth.

GCI 2019 also identifies a surge in average GDP per capita across all three country clusters. The averages of Frontrunners, Adopters, and Starters have increased to US$58,110, US$17,200 and US$3,800 respectively this year. Frontrunners have increased to US$58,110, US$17,200 and US$3,800 respectively this year. Frontrunners enjoy the largest 12-month expansion of GDP per capita, of US$900 and US$100 respectively across all three country clusters. The GDP per capita of Frontrunners, Adopters and Starters have increased to US$58,110, US$17,200 and US$3,800 respectively this year. Frontrunners enjoy the largest 12-month expansion of GDP per capita, of US$900 and US$100 respectively over the past 12 months.

GCI 2019’s research methodology has expanded its research methodology in 2019 to provide policymakers with a comprehensive picture of AI’s growing influence on the global economy.
Contrasts grow as Frontrunners pull further ahead

A quick comparison of how the digital economy developed in the years between the GCI reports from 2015 to 2019 demonstrates the degree to which Frontrunners are pulling ahead of less developed economies. In 2015, the gap in average GCI scores between Frontrunners and Adopters was 21.7 GCI points. That gap grew to 23.1 points in 2019. During the same period, the gap separating the average scores of Frontrunners and Starters grew from 37.5 points to 41.9 points. The GCI point spread between Frontrunners and Adopters grew from 21.7 points to 23.1 points in 2019. During the same period, the gap separating the average scores of Frontrunners and Starters grew from 37.5 points to 41.9 points. The GCI point spread between Frontrunners and Starters has expanded on average by 3% annually from 2015 to 2018. Since the publication of GCI 2018, that gap grew by 4%, due in part to the influence of AI, which has accelerated GDP growth for Frontrunners.

Since advanced digital economies are better positioned to fully leverage the capabilities of Intelligent Connectivity to drive growth, the Frontrunners of the GCI S-curve have taken a steeper trajectory this year, reflecting a spurt in economic growth from deploying new technologies.

Top movers in one year

- Once again, the US claimed the top spot in the GCI rankings in 2019, followed by Switzerland, which moved ahead of last year’s second-ranked Singapore.
- Among the 79 countries ranked in the GCI 2019 report, the Adopter nation Bulgaria enjoyed the largest increase in GCI score, climbing eight positions to reach number 34 in the rankings.
- Other rising stars among the Adopters include Ukraine, which climbed four places from 2018 to rank 50. A few countries, including Bangladesh, China, Japan, Lebanon, Norway, and Vietnam, also rose three ranks in this year’s GCI.

Top movers in one year

- Over the past year, Adopter country Bulgaria has seen a remarkable improvement in its GCI scores, jumping four points to 51 thanks to its National Broadband Infrastructure Plan and other favorable initiatives. The plan prioritizes building broadband infrastructure for next-generation access and the increased use of the radio spectrum, with boosting access in remote and sparsely populated areas a top priority. It also sets broadband targets in line with the Digital Agenda for Europe: at least 30 Mbps for 100% of the population and 100 Mbps and above for at least 50% of households by 2020.

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Aspiring to transform into Digital Bulgaria, the European nation solidified its roadmap for achieving its targets. In just 12 months, the nation has made outstanding improvements in mobile broadband access, affordability, and maturity, opening up enormous opportunities for Bulgarian citizens and businesses due to enhanced broadband infrastructure and new digital services.

- Vietnam is the rising star among Starter nations, improving its GCI score by two points to 37 in 2019. With a population of 94.6 million, the Southeast Asian country has significantly increased smartphone penetration and mobile broadband subscriptions. According to Vietnam’s Ministry of Information and Communications (MIC), the country’s base of 4G subscribers grew to more than 13 million in 2018, which accounts for about 30% of the total number of mobile phone subscribers. While still investing heavily in 4G, Vietnam is already gearing up to become one of the first Southeast Asian countries to roll out 5G. The nation’s biggest carrier Viettel has announced plans to launch 5G services by 2021 and is preparing to test a 5G broadcast station in Hanoi with speeds of 600 to 700 Mbps.

- The Swiss have aggressively invested in 4G to make mobile broadband services widely available and affordable for the country’s 8.5 million people. Switzerland today enjoys one of the highest broadband penetration rates in Europe and among OECD nations. In 2019, the Swiss government auctioned frequencies on the 5G mobile spectrum for 380 million Swiss francs (US$379 million) to boost the development of IoT, industrial automation, and autonomous vehicles. In addition, Switzerland’s Federal Office for National Economic Supply (FONES) published a new ICT minimum standard to protect against cybersecurity in 2018. The ICT cyber risk standard aims to strengthen cybersecurity for all sectors of the economy and society and protect the operators of Switzerland’s critical infrastructure. Reinforcing its ICT security and installed base of secured servers was an important factor in Switzerland’s GCI score increase of five points from 2018 to 2019.

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**Top movers in four years**

From the GCI’s first edition in 2015 to the 2019 report, we’ve witnessed remarkable growth in the global digital economy. During that time, four countries stand out among Adopter and Starter nations for their impressive improvement in GCI scores: Ukraine, South Africa, Bangladesh and Algeria.

**Ukraine**

Ukraine is a rising star among the Adopters – its GCI score has climbed 12 points in just five years. The country’s mobile subscriptions jumped from 8% to 95% penetration from 2015 to 2019, and government statistics record that of Ukraine’s 26 million Internet users, more than 25 million access the web via mobile broadband. GCI 2019 also found that Ukraine has significantly improved its cybersecurity awareness and ICT laws. Alongside Tunisia, it was one of the first NATO partners to position cybersecurity training as part of the NATO Defense Education Enhancement Program last year. In 2017, HI-TECH OFFICE UKRAINE worked with various Ukrainian cities to launch the Digital City – Digital Ukraine project, which aims to improve e-government services. The program is designed to integrate efforts to create common approaches for the systematic implementation of smart grid projects and initiatives in Ukrainian cities.

**South Africa**

South Africa has moved up 10 GCI points since 2015. The Adopter nation has invested significantly in ICT and has increased mobile broadband subscriptions from a penetration rate of 51% to 103% over five years. Smartphone penetration also expanded from 33% to 86% over the same period. While ICT availability and adoption are not widespread in South Africa, the government has proposed to use ICT to promote efficiency and effectiveness, with the aim of making government services accessible on digital platforms to more than 57 million citizens. Notable e-government successes include the National Treasury’s eTender Publication Portal, eHomeAffairs, and the South African Revenue Service’s eFiling system.

**Bangladesh**

In less than five years, Starter nation Bangladesh boosted its GCI score by seven points. Since 2015, mobile subscription penetration jumped from 5% to 41% and smartphone penetration from 7% to 34%. In addition to mobile subscriptions, the country’s fiber to the home (FTTH) coverage and fixed broadband base also made significant progress. E-government services also grew thanks to the Bangladeshi government’s support for public-private dialogue and collaboration on digitalization. A United Nations report described the Bangladeshi government’s support for digitalization and ICT development as “exemplary.” As part of Vision 2021, Digital Bangladesh aims to transform the country into a modern, knowledge-based society that promotes digital inclusion by 2021.

**Algeria**

Algeria’s GCI score has climbed eight points since 2015. During that time, the North African Starter nation recorded strong growth in mobile broadband and smartphone subscriptions, the penetration of which increased from 21% to 78% and 14% to 55% respectively, due in part to the introduction of 4G services in 2016. As market competition intensifies in Algeria, 4G services have improved and become more widely available for its 42 million citizens. Capitalizing on its 4G success, Algeria is also working today to become an early adopter of 5G network services. Algeria Telecom subsidiary Mobilis successfully tested 5G connections in Oran during the Smart Algeria Forum. The Algerian government has updated its ICT legal framework and introduced a series of new regulations to support the sector’s growth, sparking a surge in the number of software developers and new business models in the country. For instance, more than 100 Algerian startups have already contributed to the Algiers Smart City project launched in 2017 as part of the city’s strategic urban development plan.
Expanded GCI methodology reflects AI’s impact

The GCI has revised its methodology over time to better capture how technology evolves and provide actionable insights on the correlation between ICT investment and GDP growth. We did so again this year to highlight AI’s role in empowering Intelligent Connectivity.

The first change in methodology was to assign AI indicators heavier weight in the model, as AI exercises a positive impact on the other technology enablers as well as having its own direct impact. Each indicator has a scale based on a realistic target value for beyond 2025, with a score of 10 reflecting that the target value has been reached.

Two other notable changes in the research methodology were made: merging the Data Centers parameter into Cloud, and incorporating Big Data into the newly created AI parameter. The new AI parameter includes Data creation, AI Investment, AI-enabled robotics, and AI potential. While the research methodology expanded in 2019, we also did some consolidation. Intelligent Connectivity’s five enabling technologies were consolidated into four: Broadband, Cloud, IoT, and AI. The expanded methodology’s impact on the GCI is also notable as it clearly shows how AI has turned even the most advanced digital economies into “beginners” that are learning how to apply the new technology. At the same time, the new methodology highlights how Intelligent Connectivity, which includes AI, has opened a new cycle of economic growth for countries on the GCI S-curve. The full score of GCI 2019 has also increased from 100 to 120 to reflect ICT’s impact on future economic growth.

The new 40 indicators of GCI 2019

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<tr>
<th>Four Pillars</th>
<th>Supply</th>
<th>Demand</th>
<th>Experience</th>
<th>Potential</th>
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<tr>
<td><strong>Foundation</strong></td>
<td>ICT Investment</td>
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<td>App Downloads</td>
<td>Smartphone Penetration</td>
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<td>E-Government Services</td>
<td>Telecom Customer Services</td>
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<td>R&amp;D Expenditure</td>
<td>ICT Patents</td>
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<td>New Business Models</td>
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<td><strong>Broadband</strong></td>
<td>Fiber Optic Connections</td>
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<td>Broadband Potential</td>
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<td><strong>Cloud</strong></td>
<td>Cloud Investment</td>
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<td><strong>Internet Of Things</strong></td>
<td>IoT Investment</td>
<td>IoT Installed Base</td>
<td>IoT Analytics</td>
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<td><strong>Artificial Intelligence</strong></td>
<td>AI Investment</td>
<td>AI-enabled Robotics</td>
<td>Data Creation</td>
<td>AI Potential</td>
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Intelligent Connectivity’s ability to drive economic expansion will be a welcome influence in 2019 at a time when the IMF’s World Economic Outlook sees global GDP growth slowing due to a toxic cocktail of trade tensions and political uncertainty. Intelligent Connectivity’s ability to accelerate technology development to support innovative business models and solutions may offer promising new options to help keep GDP growth on track.

Growth prospects for countries in the GCI are increasingly tied to their ability to improve ICT infrastructure by making connectivity smarter. Connectivity can be understood as a mix of ICT infrastructure, including broadband, cloud, and IoT. But when AI is added to the mix, it is transformed into Intelligent Connectivity. With Intelligent Connectivity, AI plays a dual role: the first is to optimize how ICT infrastructure functions together; the second is that AI can help workers make faster and better decisions. Both accelerate the digitalization of society and economies, and help create new products and services. Intelligent Connectivity is shaping a future where increasingly all things will move, act, react, and collaborate wirelessly and seamlessly with human actions, preferences, commands, and even intentions. But this change is not inevitable and will not be painless. It requires investment, infrastructure, data, and above all a willingness to take advantage of the opportunities that the new technologies provide.

In GCI 2018, we forecasted that an additional US$23 trillion in economic potential will be available by 2025 if each country featured in the GCI increases its annual ICT infrastructure investment by 8% (CAGR). Elevating ICT infrastructure to the level of Intelligent Connectivity is a crucial step for countries that aim to achieve sustainable growth.
Digital investment inflection points accelerate GDP growth

In 2016, the GCI identified several inflection points where a nation’s investment in ICT infrastructure jumps-starts GDP growth. These inflection points are ramps to the fast lane of the digital highway. For developing nations working to build basic broadband infrastructure, achieving a GCI score of 35 points typically accelerates digital development and opens a range of Internet-driven business opportunities that boost GDP growth. GCI Starters prepared to take advantage of this inflection point can find themselves on a fast track to digital development and sustainable growth.

Digital economy inflection points are not limited to Starters, however. A major finding in GCI 2019 is that countries higher up the GCI S-curve – in particular Frontrunners with the most advanced digital infrastructure – also benefit from an inflection point that ignites GDP growth, which will help them to enter a new economic growth cycle. Recently, many Frontrunners with a long history of aggressive investment in ICT infrastructure saw growth stagnate due to having exhausted much of the value from existing ICT infrastructure.

When these nations begin to tap the benefits of Intelligent Connectivity, their enhanced digital capabilities will potentially accelerate GDP growth. As Intelligent Connectivity breathes new life into their economies, the US, Switzerland, Singapore, Japan, and other Frontrunners have set in motion a new cycle of digital economic growth. While Starters and Adopters may still lack the ICT infrastructure to leverage the value of AI solutions, the technology should be a focal point in policymakers’ long-term strategies. Government and industries in the Starter and Adopter nations need to prioritize work on national Intelligent Connectivity and AI initiatives to speed up access to these technologies, which are set to play a growing role in building the global digital economy.

GCI 2019 – S-Curve

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<tr>
<th>Starters</th>
<th>Adopters</th>
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<tr>
<td>Average GDP</td>
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<td>Per Capita</td>
<td>Per Capita</td>
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<tr>
<td>US$1,500</td>
<td>US$5,100</td>
<td>US$30,100</td>
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<tr>
<td>GCI Score Range: 25–39</td>
<td>GCI Score Range: 60–64</td>
<td>GCI Score Range: 0–100</td>
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AI’s upside potential

Another key finding in the GCI 2019 is that countries at every level of digital development on the GCI S-curve are discovering an “AI upside potential” which, means that tapping the full potential of AI could significantly increase GDP growth.

Much of today’s economic benefits from AI still go to the GCI’s most advanced nations, as they have the most developed ICT infrastructure, research, and capabilities. However, even GCI Frontrunners are relegated to beginner status with AI technology while they learn how to develop, adopt, and train it to solve real-world challenges. But, with AI algorithms and services readily available on cloud platforms, Adopters, and even Starters will inevitably learn from Frontrunners’ experience and find ways to adapt the technology to work in their own ICT environment. Developing economies accessing AI will play an important role in spreading the technology’s benefits across regions and industries.

The inflection point seems to be at the 65-point GCI score, as this is when Frontrunners begin to efficiently apply AI solutions. From this point on, we expect AI’s impact to add more than 1% of potential value to Frontrunners’ GDP growth. What does this 65-point score mean for ICT adoption? We will explain more in later chapters.

The chart below also shows that countries with a higher GCI in the top right quadrant can leverage Intelligent Connectivity to grow their economies 2.4X faster than other nations for every point of GCI improvement.

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<th>Note</th>
<th>Regression analysis using AI-GDP impact ratio versus GCI 2019 scores was used to develop the model for country clusters at the 65 inflection point.</th>
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For Frontrunners like the US and Japan that possess the most advanced ICT infrastructure, AI upside potential today represents a huge gap in untapped capabilities and economic growth. In the case of the US, AI’s current impact on the country’s GDP is estimated to be 300% to 400% lower than its potential value.

Adopter and Starter economies like China, Malaysia, India, the Philippines, and Spain are determined not to be left behind, with each working to deploy AI. While still classed as an Adopter, China is among the world’s most advanced nations in terms of AI development. Policymakers and business leaders in these nations have much to learn from AI use cases, and will need to become better attuned at identifying niches or business opportunities where they can adapt AI to profitably participate in Intelligent Connectivity ecosystems. As nations improve their GCI scores and develop the infrastructure to support AI, AI upside potential will begin to make itself felt through GDP growth.

**Intelligent Connectivity creates value through collaborative ecosystems**

Intelligent Connectivity functions and creates value through collaborative ecosystems. If oil was the fuel of economic growth in the 20th century, data is the driving force of sustainable growth in the 21st century. Intelligent Connectivity ecosystems employing AI, cloud services, and IoT thrive and expand in relation to the volume and quality of available data. When more relevant unstructured data is accessible for AI to analyze, Intelligent Connectivity becomes better at predicting user needs. With higher volumes of high-quality data, Intelligent Connectivity can deliver personalized products and services to win new customers and solve real-world problems.

Moreover, higher numbers of engaged users means a greater volume of relevant data will become available. Ideally, this process continues as a virtuous cycle, fostering innovation and generating additional value across the stakeholders who comprise the Intelligent Connectivity ecosystem.

These Ecosystem Stakeholders comprise five roles: Decision Makers (countries, organizations or enterprises), Data Scientists, ICT Companies, Data Collectors, and End Users.

Decision Makers in countries at every stage of economic and digital development will need to realistically evaluate their economy’s strengths to determine the best opportunities to participate and succeed in the Intelligent Connectivity ecosystem. They will need to understand the roles of the ecosystem’s various stakeholders to develop viable growth strategies for their own countries and industries to participate.

Participants in the ecosystem can expand the scope of their expertise by collaborating across roles and domains, breaking down silos in their organizations, and creating value and more quickly delivering results to customers that increase business opportunities. At its most basic level, stakeholders in the Intelligent Connectivity ecosystem have the potential to create value and sustainable cycles of success where each of the five roles generate value and profit from their work.

Understanding how to participate and leverage the strengths of the collaborative ecosystem is crucial for policymakers and industry leaders that aim to deliver sustainable growth for their country or organization. These stakeholders are expected to play a growing role in economic development as the influence of Intelligent Connectivity expands. A closer look at how the Intelligent Connectivity ecosystem functions and the five stakeholder roles is as follows.

**Decision Makers:**

- **Function:** The initiators of Intelligent Connectivity ecosystems. They launch the ecosystems that create value, improve productivity, and expand the scope of their operations and opportunities.

- **Positioning:** Typically, a large enterprise or government entity that identifies business cases or social programs where AI can be applied through an Intelligent Connectivity ecosystem to improve operating efficiency. The strategy for ecosystem-building often involves cross-industry players that collaborate to enable innovation and expand opportunities beyond the capabilities of any single participant.

- **Examples:** Decision Makers are seen in GCI Frontrunners such as the US, Japan, Singapore, Germany, the UK, France and South Korea. China stands out among Adopter nations for its advanced work in AI and the ability to develop Intelligent Connectivity ecosystems and complete supply chains.

**Data Scientists**

- **Function:** They analyze the data flowing through the ecosystem to obtain insights and provide innovative use cases for downstream deployment by ICT Companies and Decision Makers. Data Scientists might also have the industry know-how to better understand business processes. Other industry experts are Decision Makers or industry leaders.

- **Positioning:** They offer expertise in data analytics as well as experience in developing and deploying machine learning algorithms. Their work requires advanced infrastructure services and skills supported by consulting groups, universities, and research organizations. Data Scientists represent the highest value element of an ecosystem due to their high labor costs and focus on creativity and services. They are in short supply worldwide — currently there are only an estimated 300,000 AI professionals in the world, of which only about 10,000 (3.3%) are qualified as ‘specialists’ according to the World Economic Forum. Millions of Data Scientists will be needed as Intelligent Connectivity ecosystems expand around the world. The demand for experienced Data Scientists has made this group a mobile workforce, moving to follow career opportunities, and in some developing nations causing a brain drain of these specialists.

- **Examples:** Advanced economies, such as the UK, Singapore, Switzerland, and Finland, have become centers for Data Scientists where government and business support the education and research infrastructure needed to develop AI solutions.

**Data Collectors**

- **Function:** They collect and share the data necessary to create actionable insights, train AI systems, develop business models, and provide customized services for ecosystem players. Data Collectors can come from countries at any level of economic development – from a business executive providing feedback on a business-class flight to a farmer monitoring and sharing crop data to a senior citizen making their opinion heard on a government service.

**Frontrunners**

- **Positioning:** Frontrunners such as the US, Japan, South Korea, China, and the five stakeholder roles is as follows.
• **Positioning:** They play an indispensable role in supplying the basic data that drives the ecosystem. Once data is collected, it is passed to other players for further analysis to become productive. The key to the success of Data Collectors is their ability not just to access data, but to access the most relevant and useful data the ecosystem requires. The nature and aims of Data Collectors vary: they can be, for example, paid workers or volunteers, farmers or fishermen paid to deliver crop or fisheries data, a museum visitor offering feedback on their experience, or HR or logistics departments that collect data for a company. Feedback from End Users across all business sectors or government services also plays a role in data collection.

• **Examples:** Nations at every level of economic development may be data rich and generate vast amounts of both structured and unstructured data relevant to an ecosystem’s success.

**ICT Companies**

• **Function:** They provide a wide range of technical knowledge and support (both software and hardware, including infrastructure, platforms, and systems) and systems know-how (for example, AI robotics, data management, and network skills) that support the ecosystem’s technical platform. They can also be scientists or R&D personnel working in a laboratory or a field engineer monitoring how systems function.

• **Positioning:** While not in short supply like Data Scientists, ICT Companies must be vigilant that their teams are constantly upgrading their skills to keep pace with the ecosystem’s often fast-changing requirements. Likewise, nations must continually invest in their Intelligent Connectivity platforms to support the development of ICT Companies, or top talent will follow job opportunities elsewhere.

• **Examples:** Adopter and Starter nations, such as India, China, and the Czech Republic, play important parts in developing ICT Companies to serve ecosystems due to their often large, high-quality, and typically lower-cost ICT talent pool.

**End Users**

• **Function:** They benefit from Intelligent Connectivity by receiving and supporting an ecosystem’s services and products and, as customers, are crucial to the ecosystem’s success. When End Users can appreciate the value, products or services developed and provided by the Intelligent Connectivity ecosystem, they provide the motivation for ecosystem players to sustain and further develop the system.

• **Positioning:** They can be individuals, devices, companies, governments or even international organizations. Typically, they have little to do with the ecosystem’s development and may even be unaware of it. In addition to their primary role, End Users are both Data Providers and Data Collectors.

• **Examples:** Products or services enjoyed by End Users could be funded by local governments, policymakers, global NGOs, and bodies like the World Bank and Asian Development Bank, with policy agendas such as alleviating poverty. Conversely, End Users can be companies or individuals acting as consumers of the ecosystems’ products and services. End Users can also simply be individual customers.
It takes a global Intelligent Connectivity ecosystem to build the autonomous vehicle

Success for automakers in the 21st century will increasingly mean optimizing global operations via an Intelligent Connectivity ecosystem. Let’s suppose a European multinational automaker planned an Intelligent Connectivity ecosystem to design and manufacture autonomous vehicles. A global ecosystem could look something like the following example.

A typical Intelligent Connectivity value chain

In step one, the company or Decision Maker invests in designing and developing autonomous vehicles at its European headquarters. Once the initial planning is settled, step two sees the Decision Maker identify and bring onboard a team of Data Scientists and machine learning (ML) engineers based in Israel. This team is charged with developing models and analytics for the proposed new vehicles.

The Data Scientists’ program is then tasked with designing computer vision models that interpret changing road views. In step three, this group identifies and invests in a US/Indian computer vision platform that can outsource visual image data tagging or Data Collector work efficiently and cost effectively in India. Next is step four, where the new application’s End Users could then be the buyer of a fleet of autonomous vehicles to serve as rental cars in Australia. But even the End User can also play a role of data provider and data collector in the ecosystem, as the vehicle generates massive amounts of data that can later be analyzed by the Data Scientist team in India. When the direct and indirect benefits of this Intelligent Connectivity ecosystem beyond the revenue generated are finally considered, they can include fewer injuries or even deaths from road accidents, lower cost of ownership or operations for drivers, and more efficient, sustainable resources for the ecosystem’s participants.

The efficient and cost-effective development of the successful autonomous vehicle depends on the participation and value-add from each group and country involved from around the world. Thus, the concept of Intelligent Connectivity is not the sole domain of a few Frontrunners, as every country can play a role in these ecosystems and profit from them. Policymakers from the Adopter and Starter countries should start planning how they can best tap the benefits of this new economic model.

Global win-win collaboration is the key to success

While “Decision Makers” and “End Users” might be expected to derive the lion’s share of benefit from an Intelligent Connectivity ecosystem, R&D may in fact be more evenly apportioned to nations and industries across the development spectrum than initially supposed. The idea that Intelligent Connectivity’s benefits accrue only to the most technologically advanced countries is a misconception.

In fact, policymakers and industry leaders in nations at every stage of economic development are discovering ways to participate in Intelligent Connectivity ecosystems. However, those with isolationist and protectionist inclinations stand to fall behind, as ecosystems at the local, regional, and global scale will increasingly rely on cross-industry and international collaboration to create value. The collaborative nature of the ecosystems makes the model a win-win for all participants – nations, enterprises, social enterprises, and individuals. Although it’s still early days for Intelligent Connectivity ecosystems, the new economic value, growth opportunities, and win-win business models created can be expected to help solve an array of socioeconomic challenges and set the pace for global GDP growth in future.

However, this does not mean that countries should let up on their GCI progress to develop Intelligent Connectivity. Using the case study earlier as an example, countries with higher GCI scores tend to have more Decision Makers and enjoy much higher benefit from the Intelligent Connectivity ecosystem than everyone else.

The rise of Intelligent Connectivity marks a critical inflection point in global digital transformation, and is already having a significant economic impact in countries at all development stages. While still in its infancy, the potential of Intelligent Connectivity to drive GDP growth via innovative problem-solving and the development of new business models and technologies will affect virtually every aspect of society and national economies in ways yet to be imagined.
SUMMARY

We expect nations that cross the GCI tipping point of 65 and at the same time focus on AI adoption to develop the potential to add more than 1% to their GDP growth. For Frontrunner economies, this will be a breakthrough after several years of sluggish growth caused in part by reaching the maximum value-add of previous ICT investment.

The most advanced Frontrunners leveraging Intelligent Connectivity could grow their economies 2.4X faster than other nations for each point of GCI improvement.

The five types of stakeholders in an Intelligent Connectivity ecosystem reflect the rise of cross-border collaboration and thus business opportunities.
The convergence of technologies – broadband, cloud, IoT, and AI – first seen in GCI 2018 have come together under the banner of Intelligent Connectivity to put AI to work accelerating the development of new technologies and applications, disrupting established business models and turbocharging economic growth. 5G’s much anticipated speeds will soon complement Intelligent Connectivity on the global economy, its addition to the speed networks are finally becoming a reality. 5G’s rapid rollout will create new economic growth. With 5G field trials nearly complete, new high-speed networks are finally becoming a reality. After commercial rollouts in South Korea and the US in 2019, more than 70 mobile operators around the world announced 5G launch plans, with more than 50 scheduling 5G mobile services to begin by year-end 2020. While it’s still premature to predict 5G’s eventual impact on the global economy, its addition to the Intelligent Connectivity mix is expected to spur new economic growth.

Intelligent Connectivity today is primarily the domain of countries with advanced ICT infrastructure – the GCI’s Frontrunners and a handful of Adopters. For others, it remains a work in progress as policymakers’ direct investment to build out the underlying technologies needed to deliver Intelligent Connectivity. Accessing the potential of this powerful new technology should be a high priority for policymakers in countries at every stage of digital development, as Intelligent Connectivity is expected to fuel a new wave of global GDP expansion. The formula for success is simple: Governments should invest in Intelligent Connectivity’s foundation technologies with a particular focus on two critical preconditions needed for AI to be effective – cloud and IoT.

5G requires a solid base of cloud and IoT
Investing in broadband infrastructure has long been the focus of policymakers’ ICT strategy. Today, their investment strategy is looking to a broader range of technologies and opportunities beyond Internet-driven businesses. AI readiness is increasingly the focus of policymakers and industry leaders, and this first requires strengthening the ICT platform for Intelligent Connectivity. At the same time, attention must be paid to the two touchstones of AI readiness – cloud and IoT.

Cloud provides the data storage and computational capabilities and IoT delivers the data that AI systems require to scale and deliver analytical power. Another precondition for AI readiness is a strong installed base of IoT, which collects and creates the massive datasets that AI systems need to develop insights and expand their capabilities for machine learning. This year we found that when a nation’s cloud readiness score and IoT readiness score cross the 50 and 45 mark respectively, AI’s impact on their economy begins scaling up. Another major finding of this year’s GCI 2019 is that a country is required to achieve ICT investment between 3% to 4% of its GDP to achieve the cloud and IoT readiness levels needed to create the tipping point for AI to take off. Policymakers planning for the long-term benefits of deploying AI need to be aware that a solid foundation in these two technologies is key to activating the AI capabilities necessary to drive strong economic growth.

The reason for the condensed timeline is that 5G has started its roll-out with several distinct advantages. Unlike the launches of 3G and 4G technology, 5G will have more than 40 5G-ready devices, mostly smartphones, already available in the market in 2019. In addition, 5G semiconductor devices and routers are available on the market today, in advance of 5G network availability. This up-front 5G infrastructure is expected to give the technology a strong head-start and shorten its adoption timeline.

Cloud and IoT Investment Set the Stage for AI and 5G Business to take off

The formula for effective – cloud and IoT.

Critical preconditions needed for AI to be stage of digital development, as Intelligent Connectivity’s foundation technologies with a particular focus on two critical preconditions needed for AI to be effective – cloud and IoT.

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Cloud investment per GDP – 0.02%
Cloud migration rate – 23%
The core value of the Intelligent Connectivity platform is its ability to make AI accessible. This is an important breakthrough as AI opens economic growth possibilities by accelerating the development of new technologies and applications, enabling business leaders to re-imagine industries and helping entrepreneurs to create innovative new business models. In fisheries management, for example, an often tradition-bound business is discovering new methods to improve efficiency and profits using mobile broadband technologies. The current fisheries industry value chain comprises fish stocks, fishermen and fish farms, local distributors and processors, retailers and exporters, and finally consumers.

Prior to the availability of the new connectivity, interaction among stakeholders was limited to direct, one-on-one communications. Bringing distributors and processors, retailers and exporters, and finally consumers.

Intelligent Connectivity offers opportunities to transform industries

Connecting everything for an intelligent world

We expect 5G networks to reach critical mass for the world’s population much faster than 3G and 4G. As 5G’s global uptake grows, it is predicted that it will begin to converge with other technologies that enable Intelligent Connectivity such as cloud, IoT, and AI from 2025 onwards. 5G’s role in delivering agile and low-latency connectivity will gradually become the foundation for the converged technologies to work optimally and intelligently to address an array of socioeconomic challenges. As this mix of technologies begins to connect virtually everything and everyone in the future, we can expect it to fill critical gaps by intelligently optimizing scarce resources, improving productivity, and creating new business models.

As the technologies that underpin Intelligent Connectivity start to cross and converge, they will spur innovation with the potential to profoundly change our everyday lives. For example, delivery companies today are already developing drones to deliver parcels and food by tapping the capabilities of cloud, IoT, and ultra-low-latency mobile broadband. We can expect entrepreneurs to develop and deploy disruptive new technologies such as AR to develop innovative solutions across many industries. In healthcare, for example, scenario-based AR can be used to train medical students and provide them with the diagnostic and surgical skills to serve remote areas.

Smart Cities is another area where technology convergence will play a major role. By 2050, 66% of the world’s population will be living in cities, according to UN estimates. Transforming fast-expanding urban areas into Smart Cities today has become the goal of countries aiming to tackle socioeconomic challenges like traffic congestion, waste management, e-government services, energy, healthcare, security, social engagement, and much more.

The technologies that support autonomous vehicles will also have a role to play in transforming the way we live in the future. Consider that there are 1.4 billion vehicles on the world’s roads today around the world. The challenges they present aren’t limited to the growing need for energy to run these vehicles, or the need to manage the traffic congestion they create. They have another, more profound impact: close to 1.25 million people die each year in traffic accidents, making such accidents the 9th leading cause of death and accounting for 2.4% of all deaths globally.

There are other down sides to the growing number of vehicles on the world’s roads as well: air pollution, the cost of vehicle ownership, and a lower quality of life for many due to congestion and long commute times – all of which will be addressed by Smart Cities.

Intelligent Connectivity is predicted to play a key role in managing transportation issues. For example, Intelligent Connectivity will enable the data collected from smart sensors and actuators on each vehicle, streetlights and highways, and in traffic black spots and car parks to be delivered to a central transportation system via the cloud. AI systems in the world will then identify and deliver insights for traffic controllers who will advise drivers (or autonomous vehicles directly) on the shortest, fastest, and safest routes to their destinations, and offer tips on how to avoid collisions. From a city government perspective, autonomous cars could communicate with street lighting in the areas they’re driving through, so only roads in use need to be illuminated, saving energy and money while keeping drivers safe.

It’s not difficult to imagine the potential impact that technology convergence will have, reducing traffic and mortality rates while improving public safety and optimizing the overall transportation system.

How Intelligent Connectivity changes the value chain in fisheries
SUMMARY

The convergence of technologies – broadband, cloud, IoT and AI – comes together under the banner of Intelligent Connectivity to activate the power of AI, enabling development of innovative new business models, services, and opportunities.

5G’s rapid rollout will create new economic growth.

Cloud and IoT are the touchstones of AI readiness. AI will start to scale as the capabilities of these fundamental technologies begin to dial up.
Intelligent Connectivity is recognized as a powerful business tool, but it also has the potential to provide innovative solutions for many of the world’s most difficult and longstanding social problems.

Policymakers and corporate Decision Makers today are quickly learning how to manage Intelligent Connectivity and AI’s capabilities to drive economic growth. But at the same time, and perhaps less visibly, there is equally important work taking place among NGOs, social enterprises, and startups that are applying and scaling up Intelligent Connectivity and AI to address some of society’s most pressing challenges. Among their early targets are healthcare, hunger, education, inclusion, environmental conservation, and crisis response. Financial inclusion, environmental conservation, and improving medical diagnoses are three areas where Intelligent Connectivity is today being actively applied for the public good.

Financial inclusion: Intelligent Connectivity has a unique role to play combating global poverty, with mobile networks expanding financial inclusion. Egypt stands as an example of how mobile phones can make a difference for the poor. In Egypt, cash remains king and electronic payments account for only a tiny proportion of transactions. Out of the nation’s population of 100 million, the World Bank estimates that just 10-15% of Egyptians have a bank account, one of the lowest penetration rates in the world. With few bank branches and Automatic Teller Machines (ATMs) per capita compared to countries with similar per-capita income, and most services concentrated in urban areas, many Egyptians are cut off from economic opportunities and severely limited in finding means to improve their financial prospects.

With Egypt’s population expanding at about 2% or 2 million people a year, demand will increase for all services, including those offered by the government, creating more opportunities for digital solutions. Developing Egypt’s financial sector and broadening the range of available services to be more inclusive is crucial to promote economic growth in a country where youth unemployment exceeds 30%. Increasing access to financial services is an important step to reducing poverty, according to the World Bank, as it accelerates job creation, and 28 million smartphone users, Fintech offers Egyptians the best chance to access financial products and services. Overseas workers’ remittances are a case in point. The ability to receive remittances via a mobile phone is having a significant and growing impact in Egypt. Money from Egyptians working abroad is important not only to send to their families, but also to invest in new businesses. In 2016, remittances accounted for an estimated 20% of capital used to launch new businesses in Cairo, according to the World Bank. On average in 2018, foreign remittances of US$220 were charged a fee of US$14, or 7%, a significant amount for low-wage workers. Egypt isn’t alone in relying on such remittances. The World Bank estimates that some US$330 billion in remittances were sent globally in 2018.

Environmental conservation: Deforestation has long been ignored as the price of progress. But the loss of forest land is now playing a major role in climate change. Deforestation today accounts for nearly 20% of the world’s total carbon emissions. Turning this disaster around will be difficult as up to 90% of deforestation is due to illegal logging. One non-profit group, Rainforest Connection (RFCx), is putting Intelligent Connectivity and AI to work to fight deforestation and protect the millions of species that inhabit the earth’s rainforests.

Acting as an Intelligent Connectivity ecosystem “Decision Maker”, RFCx looked to Huawei Cloud and Data Scientist expertise to help develop digital conservation solutions. RFCx came up with a solution that mixes a low-tech common-sense approach with the data-crunching capabilities of AI. RFCx has upcycled old Huawei phones to create a fully connected intelligent ecosystem to monitor the world’s rainforests. The phones communicate continuously with AI-equipped servers and when suspicious sounds such as chainsaws or trucks are detected in a forest, rangers on the scene are notified in real time to investigate. This Intelligent Connectivity-based solution is already deployed across forests in 10 nations including Brazil, Indonesia, Peru, Romania, the US, and South Africa, protecting more than 2,500 km² of forest – an area equivalent to almost 200,000 football stadiums.

The digitalization of payments promises to change the lives of unbanked Egyptians. Think of the loss of productivity, not to mention inconvenience, of having to pay bills by cash in person during office hours. Add to that the opportunities for corruption in a cash-centric society. Since Egypt’s unbanked are not entrenched in the traditional banking practices of branches, ATMs, and credit cards, they’re more open to accessing banks and conducting payment transactions on their mobile phones.

The latest updates to the World Bank’s Global Findex database in 2018 notes that the availability of mobile phones among the poor worldwide offers the opportunity to increase financial inclusion via mobile accounts, especially if governments lend credibility by taking the lead. Digital services offer the unbanked a safer way to handle transactions, since workers do not have to carry cash. These services also have the added advantage of helping the poor avoid many transaction fees and the need to submit to corruption.

With Egypt’s mobile penetration rate of 102% and 28 million smartphone users, Fintech offers Egyptians the best chance to access financial products and services. Overseas workers’ remittances are a case in point. The ability to receive remittances via a mobile phone is having a significant and growing impact in Egypt. Money from Egyptians working abroad is important not only to send to their families, but also to invest in new businesses. In 2016, remittances accounted for an estimated 20% of capital used to launch new businesses in Cairo, according to the World Bank. On average in 2018, foreign remittances of US$220 were charged a fee of US$14, or 7%, a significant amount for low-wage workers. Egypt isn’t alone in relying on such remittances. The World Bank estimates that some US$330 billion in remittances were sent globally in 2018.

Today, Egypt aims to pioneer digital payments in the North Africa region, according to the country’s National Telecommunication Regulatory Authority. In 2018, Egypt introduced regulatory reforms designed to tap the potential of mobile money and expand financial inclusion, according to a GSMA report. Early indications are that these programs are making progress. The nation’s Central Bank estimates that there were 20 million mobile money accounts in 2018, and the Bank aims to increase that to 40 million accounts in two years.

An estimated 1.7 billion adults worldwide still have no access to a bank account, according to the World Bank. But there is good news too. About two-thirds of these unbanked own a mobile phone that they can use to access financial services. Making that connection to Fintech services is the key to expanding financial inclusion and an important step in combating poverty for unbanked consumers in Egypt and globally.
RFCx is also developing Intelligent Connectivity ecosystems to tackle animal conservation and thus slow the rising extinction rate, which is now estimated to be 50,000 species a year, seriously undermining the health and biodiversity of rainforests. RFCx chose to focus on a species it considered to be a bellwether of forest health – the Spider Monkey. RFCx developed an Intelligent Connectivity ecosystem to protect the Spider Monkeys that play a key role in the seed dispersal that’s essential for forest sustainability. Habitat destruction, often due to illegal logging, has left Spider Monkeys a critically endangered species. RFCx turned to Huawei to develop a platform capable of detecting Spider Monkey sounds. Upcycled old Huawei phones were placed in boxes in trees to capture audio from the forest that is streamed to the cloud where Huawei Cloud AI analyzes the animals’ behavior and movements. RFCx is currently optimizing its first voice-detection model by adopting a high-precision recognition algorithm to reduce the false positive rate and eliminate user fatigue caused by the work to invalidate false positives.

Diagnostic accuracy: Healthcare is another area where Intelligent Connectivity is already making a difference by augmenting the work of skilled medical specialists. The world today faces a shortfall of 7 million doctors and nurses, a situation that is particularly acute in developing nations. The challenges facing doctors and other healthcare professionals can be overwhelming; for example, managing massive volumes of paperwork, which in turn limits face-time with patients, keeping up with the latest research; rising costs; and the increasing likelihood of errors. Intelligent Connectivity, however, is enabling innovative new technologies such as virtual nurses, health assistants, robotic nurses, automated diagnoses, and treatments. These new capabilities have the potential to revolutionize the practice of medicine.

Intelligent Connectivity today is already enabling innovative new tools to fight diseases affecting millions around the world. Cervical cancer, which the World Health Organization cites as the fourth most frequent cancer women face, is an example of how Intelligent Connectivity is opening the way to new screening tools to save lives.

Early diagnosis is critical to survive cervical cancer; however, the availability of PAP tests carried out during a pelvic examination is limited by a shortage of licensed pathologists required for screening. China, despite its high incidence of the disease, suffers from a shortage of 90,000 pathologists, according to one 2018 study. KingMed Diagnostics, a Chinese medical diagnostic test company worked with Huawei Cloud engineers to develop an AI-assisted test to compensate for this shortage. The tool it developed is over 99% accurate and testing is done at one-tenth the cost in a fraction of the time it takes for a PAP test.

To train, validate and test the AI, developers fed it with over 43 million cervical screenings collected from around the nation. While pathologists on average spend six minutes examining samples under a microscope for a PAP test, the new AI-assisted test takes only 36 seconds. KingMed is now exploring applications for the technology to be applied to pathologies for the digestive system, kidney, blood, and breast.

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How Intelligent Connectivity transforms healthcare

Intelligent Connectivity Shakes Up Healthcare

Before

Patient Benefits from Intelligent Connectivity

Healthcare

• Shortfall of 4 million doctors and 3 million nurses globally
• Worse in rural areas and developing countries with high population growth
• Shortfall of nurses trained to meet needs of older patients in developed countries with aging populations
• Medical errors are the third leading cause of death in the US
• Paperwork takes up half a doctor’s time
• On average doctors read one research paper a month
• Doctors make most of their decisions based on advertising

Healthcare Opportunities:

• Enable drug development:
  • Record keeping and support for monitoring and support for medical conditions such as diabetes
  • Identification of skin cancer (Stanford); eye scans to prevent blindness (DeepMind / NHS); and IBM for oncology

• Health assistants:
  • Personal health guide and symptoms’ checker (e.g. YourMD medical chatbots)
  • Health assistants: Cuts time spent on trivial matters, frees up doctors’ time and reduces waiting times

• Virtual nurses:
  • Smart watch provides remote monitoring and support for common and high-cost medical conditions such as diabetes

• Diagnosis and treatments:
  • Health assistants: Cuts time spent on trivial matters, frees up doctors’ time and reduces waiting times
  • Virtual nurses: Reduces number of false alarms; keeps doctors better informed of the latest research on disease and treatments; allows nurses more time with patients

• Diagnosis: AI typically provides fast and accurate diagnoses 99% of the time. The result is increased productivity for doctors and nurses

• AI enabled record-keeping: Reduces a doctor’s time spent on paperwork and systems by 30%
SUMMARY

Intelligent Connectivity could be the answer to many of the world's most complicated and deeply rooted social challenges.

Financial inclusion: The digitalization of payments allows people, especially the unbanked, to increase their ability to save, access credit, and more conveniently make and receive payments.

Environmental conservation: By harnessing the power of Intelligent Connectivity, countries can fight deforestation and improve animal conservation to promote the health and biodiversity of rainforests.

Diagnostic accuracy: Intelligent Connectivity will enable an array of new technology-driven capabilities such as virtual nurses, robotic health assistants, and AI powered automated diagnostics that will improve healthcare access and outcomes. For example, AI-assisted PAP tests for cervical cancer can increase diagnostic accuracy to 99% while reducing the cost of tests by 90%.
The growing influence of Intelligent Connectivity and its role in enabling AI is one of the most notable findings of GCI 2019. This year’s GCI found that a country’s success in deriving value from ICT infrastructure investment and its ability to create economic growth and address social issues increasingly depends on its readiness to develop and participate in Intelligent Connectivity ecosystems. A policymaker who fails to grasp the importance of the new technologies and doesn’t identify ways to participate in the collaborative, often global ecosystems may find their country isolated from the digital dividends of the new economic order.

While countries at different stages of economic – and digital – development face their own unique market conditions, needs, and challenges, the underlying principles of developing and participating in Intelligent Connectivity ecosystems are essentially the same. The GCI 2019 report’s recommendations for policymakers are as follows:

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<tr>
<th>NEXT STEPS</th>
<th>RECOMMENDED ACTIONS</th>
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<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>Invest in Intelligent Connectivity – ensure the prerequisites are in place to participate in collaborative ecosystems</strong></td>
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<tr>
<td>• Ensure the availability of a stable electricity supply: Data Collectors, often the group that takes the lead for less developed economies to participate in Intelligent Connectivity ecosystems, need a stable electricity supply and adequate connectivity – this is especially important for regions prone to natural disasters and power outages.</td>
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<tr>
<td>• Invest in ICT strategically: Countries, especially those in the early stages of digital economy development, should strengthen cloud and IoT adoption to reach the AI tipping points identified by GCI 2019. The AI tipping points unleash a round of productivity by accelerating access to the benefits of Intelligent Connectivity.</td>
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<tr>
<td>• Promote technology convergence: Policymakers should collaborate with ICT companies and start-ups to identify and overcome technology bottlenecks in key industries.</td>
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| **2** | Prioritize AI expertise |
|       | • Conduct competitive analysis: Audit competitive advantages (national and industries) in relation to other participants in global Intelligent Connectivity ecosystems. |
|       | • Focus on existing industries: Identify expertise in particular national industries and areas where AI can expand opportunities and drive growth. These can vary widely, for example, from rubber plantations in Malaysia and fish farms in Botswana to silk manufacturing in Pakistan or medical tourism in Thailand. |
|       | • Prioritize social problems: Develop a taskforce of government officials, social enterprises, and NGOs to identify a country’s most challenging social issues and determine where AI can help. These will vary, but typically include financial inclusion, healthcare, education, and disaster relief. |

| **3** | Put support functions in place for Intelligent Connectivity ecosystems |
|       | • Conduct competitive analysis: Audit competitive advantages (national and industries) in relation to other participants in global Intelligent Connectivity ecosystems. |
|       | • Focus on existing industries: Identify expertise in particular national industries and areas where AI can expand opportunities and drive growth. These can vary widely, for example, from rubber plantations in Malaysia and fish farms in Botswana to silk manufacturing in Pakistan or medical tourism in Thailand. |
|       | • Prioritize social problems: Develop a taskforce of government officials, social enterprises, and NGOs to identify a country’s most challenging social issues and determine where AI can help. These will vary, but typically include financial inclusion, healthcare, education, and disaster relief. |

| **4** | Make Intelligent Connectivity affordable and accessible to all |
|       | • Affordability and accessibility: Provide organizations and individuals with the means to access and engage with Intelligent Connectivity ecosystems. Support measures to foster understanding of and interest in analytics and AI systems. |
|       | • Avoid ‘tragedy of the commons’ situations: Intelligent Connectivity is especially vulnerable to situations where the benefits are privatized to the advantage of a few stakeholders while the costs are shared globally across the entire ecosystem. |
### Appendix

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<tr>
<th>NEXT STEPS</th>
<th>RECOMMENDED ACTIONS</th>
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<tr>
<td><strong>5</strong></td>
<td><strong>Evolve and scale</strong></td>
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<td>• <strong>Start small, learn fast:</strong> Start small and gather data from across all aspects of the Intelligent Connectivity ecosystems to fine-tune the program. The aim must be to ensure that ecosystems can be continuously improved and self-perpetuating in a virtuous cycle.</td>
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<td>• <strong>Scale locally:</strong> Leverage a country’s local market scale to become End Users and Data Collectors in ecosystems by collaborating with countries and enterprises around the world.</td>
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<td>• <strong>Demonstrate value:</strong> Show value to the ecosystem’s stakeholders. Leverage initial success to attract investment and scale up operations.</td>
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<td>• <strong>Commercialize:</strong> Commercialize products or solutions derived from the ecosystems where possible, and license those products or services to countries or industries with similar market needs or challenges.</td>
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<td><strong>6</strong></td>
<td><strong>Codify fair practices in regulations and rules</strong></td>
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<td>• <strong>Data privacy and liability:</strong> Sustainable Intelligent Connectivity ecosystems will require laws and regulations around data privacy and liability to ensure that the rights and responsibilities of various stakeholders are well-defined and satisfied. Introduced in 2018, the European Union’s General Data Protection Regulation (GDPR) has become a de facto gold standard of data privacy regulation.</td>
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</table>
The GCI analyzes the full spectrum of measurements for intelligent connectivity and provides a detailed map of the global digital economy. The index benchmarks 79 countries according to their performance in 40 indicators that track the impact of ICT investment with GDP growth. In 2019, the GCI’s methodology has been expanded again to highlight Intelligent Connectivity’s role in boosting the digital economy. We consolidated Intelligent Connectivity’s four enabling technologies into four: Broadband, Cloud, Internet of Things, and Artificial Intelligence. Two notable changes we made were to merge the Data Centers perimeter into Cloud and incorporate Big Data into a newly-created AI perimeter. Please refer to the diagram below for details.

These advanced technologies are built on a foundation of four layers of technologies such as telecommunication infrastructure, e-Commerce, and the overall adoption of computers, smartphones, and the Internet—all of which have been key determinants of the growth and development of digital economies over the past two decades. The GCI also includes forward-looking factors such as ICT patents, R&D and the outlook for each technology’s compound annual growth rate.

The research framework thus covers a complete combination of advanced and fundamental technologies, enabling us to analyze how yesterday, today, and tomorrow intersect. The GCI analyzes digital transformation from basic levels of connectivity to supplementary, advanced technologies. The GCI has adapted its methodology over time to capture how technology evolves and to better evaluate the correlation of ICT investment with GDP growth. In 2019, the GCI’s methodology has been expanded again to highlight Intelligent Connectivity’s role in boosting the digital economy. We consolidated Intelligent Connectivity’s four enabling technologies into four: Broadband, Cloud, Internet of Things, and Artificial Intelligence. Two notable changes we made were to merge the Data Centers perimeter into Cloud and incorporate Big Data into a newly-created AI perimeter. Please refer to the diagram below for details.

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Scoring and Aggregation

For each variable, a country receives a rating of 1 (low) to 10 (high), depending on the data input. Each indicator has a scale based on a realistic target value for 2025, and is expressed on a scale of 0 to 10 indicating that the target value has been reached.

These target values are extrapolated from market penetration projections based on the highest market countries, historical data, and expert opinions. Each country’s score for 2025, and beyond, is determined by its normalized raw data value in relation to this scale. Lower Projections based on the highest ranked countries, historical data to improve accuracy.

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Demand

Full Broadband Subscriptions

Total number of subscriptions that access the Internet through a terminal that provides Internet access for the provision of broadband services.

Calculation: per capita

Mobile Broadband Subscriptions

Total number of mobile broadband service subscriptions measured in relation to the overall size of the population.

Calculation: per capita

Security Internet Services

Secure Internet Services (per 1,000 people refers to the number of households worldwide publicly published certificates according to the Network Security Server Guard. Calculation: per country

Computer Households

The number of households with access to a computer – a fixed desktop computer, laptop, or similar fundamento. Calculation: per capita

EXPERIENCE

Fixed Broadband Affordability

The price of a monthly subscription prior to an entry level fixed broadband. These entry level data allowances. The calculation is a percentage of a nation’s average monthly internet fee.

Mobile Affordability Broadband

The ratio of the entry level fixed broadband data services with a minimum of 500 MB data allowance to the average cost that a nation’s average monthly internet fee.

Broadband Download Speed

Average data speed of wired and wireless broadband Internet service subscriptions. This includes a measurement of peak and average data speeds. Calculation: per capita

Cloud Experience

An index that measures the quality of service available to customers of public cloud service providers in each country.

Cybersecurity Awareness

The Global Cybersecurity Index is a trusted reference that measures a nation’s level of preparedness and engagement with the global cybersecurity community. Calculation: n/a

ICT Influencing New Business Models

The total number of patents filed under the PCT within the inventor’s country of residence. Calculation: n/a

REFERENCES


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