

GTIPA Perspectives: The Vital Importance of Digital Inclusivity for Global Economic Growth



GLOBAL TRADE & INNOVATION
POLICY ALLIANCE

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The Global Trade and Innovation Policy Alliance (GTIPA) is a global network of independent think tanks that are ardent supporters of greater global trade liberalization and integration, deplore trade-distorting “innovation mercantilist” practices, yet believe that governments can and should play important and proactive roles in spurring greater innovation and productivity in their enterprises and economies. Member organizations advocate and adhere to research and policy consistent with a core Statement of Shared Principles. The Alliance represents a network of like-minded think tanks who have opportunities to collaborate on events, research, and reports while enjoying a platform that highlights and cross-pollinates member organizations’ work on trade, globalization, and innovation policy. Think tanks interested in joining the Alliance should contact Stephen Ezell, Vice President, Global Innovation Policy at the Information Technology and Innovation Foundation (ITIF), at sezell@itif.org.

THE GLOBAL TRADE AND INNOVATION POLICY ALLIANCE

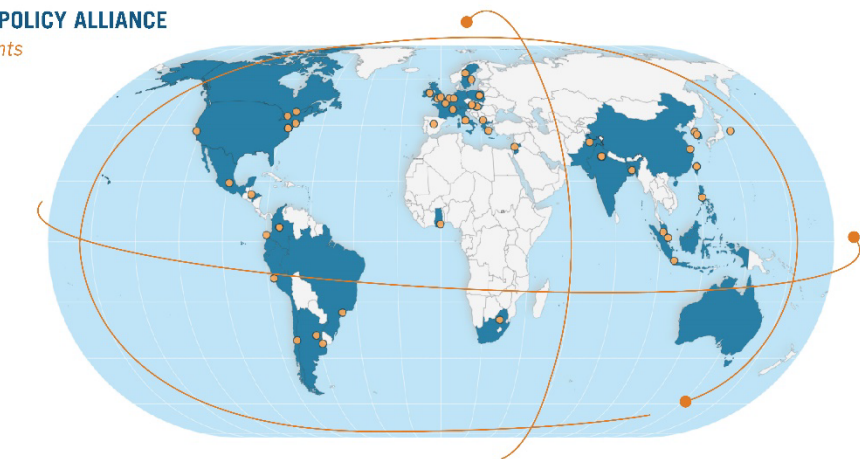
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INTRODUCTION

The Global Trade and Innovation Policy Alliance (GTIPA) represents a global network of over 50 independent, like-minded think tanks from over 30 countries around the world who believe trade, globalization, and innovation—conducted on market-led, rules-based terms—can maximize welfare for the world’s citizens. The Alliance exists to collectively amplify members’ voices and enhance their impact on trade, globalization, and innovation policy issues while introducing new scholarship into the world on these subjects.

Among their shared principles, GTIPA members are committed to approaching globalization and trade through an innovation-based perspective. This perspective recognizes the immense potential of innovation in improving existing processes, products, services, and business models, and its role in expanding economies and promoting sustainable development.

This report details how information and communications technology (ICT) is driving global economic growth and economic opportunity. It details how countries are taking effective steps to deploy digital infrastructure, enhance citizens’ digital skills and literacy, empower women and disabled citizens to leverage digital tools, and helping small- and medium-sized enterprises take advantage of digital technologies such as artificial intelligence (AI), the Internet of Things (IoT), cloud computing, robotics, big data, and other technologies. This matters, especially when the digital economy now accounts for nearly 25 percent of global gross domestic product (GDP).¹ Moreover, 75 percent of the value added by data flows over the Internet accrues within traditional industries, meaning that all industries within a nation have a vital stake in digitalization.²

A 10 percent increase in high-speed broadband Internet penetration adds 1.38 percent to annual per capita GDP growth in developing countries.

This volume compiles vignettes from fifteen countries and one region: Australia, Bangladesh, Canada, Germany, Ghana, India, Ireland, Italy, Korea, the Philippines, Poland, South Africa, Ukraine, and the United States, including the San Francisco Bay Area.

HOW ICT DRIVES ECONOMIC GROWTH

Increasing productivity—that is, economic output per unit of input, whether that input is capital, labor, data, or technology—is the principal way economies grow over time.³ Those productivity gains can come from all enterprises in a country (e.g., banks, farms, manufacturers) becoming more productive or from countries shifting the mix of enterprises in their economy (e.g., replacing lower-value-added sectors with higher-value-added ones, such as call centers with ICT services providers).⁴ While both mechanisms are important, as the McKinsey Global Institute (MGI) found in its report, “How to Compete and Grow: A Sector Guide to Policy,” the overwhelming source of a country’s productivity growth, and thus economic growth, comes from bolstering the productivity of all the enterprises and industries that already predominantly comprise an economy.⁵

And the principal way economies can increase their productivity arises from leveraging the power of ICT. ICTs represent such powerful tools precisely because they represent a general-purpose technology (GPT) that enhances the productivity and innovative capacity of every individual, enterprise, and industry they touch throughout an economy—something that holds true for both developed and developing countries.

Indeed, ICT represents “super capital” that has a much larger impact on productivity than do other forms of capital. As research conducted by Oxford Economics confirms, ICT generates a bigger return to productivity growth than do most other forms of capital investment.⁶ For instance, ICT capital has a three to seven times greater impact on firm productivity than non-ICT capital. ICT workers also contribute three to five times more productivity than non-ICT workers do.⁷ In their report, “The Impact of ICT on East Asian Economic Growth,” Ahmed and Ridzuan explained this dynamic, “The ICT revolution has contributed significantly to the whole economy by raising productivity. First, ICT increases labor productivity in ICT-using industries by making labor produce more or work more efficiently. Second, ICT makes physical capital become more productive.”⁸ As a result, revenue collection by nations that tax this ICT “super capital” through tariffs and other means is particularly damaging.

It’s vital to emphasize that the central way ICT drives a country’s economic growth is not through the production of ICT goods (e.g., the manufacturing of computers or smartphones). Rather, the vast majority of the economic benefits generated from ICT, especially in developing countries, stem from greater adoption of ICT across an economy.⁹ Ultimately, ICTs’ productivity-enhancing and innovation-enabling benefits at individual, firm, and industry levels aggregate to drive productivity and economic growth at an economy level.¹⁰

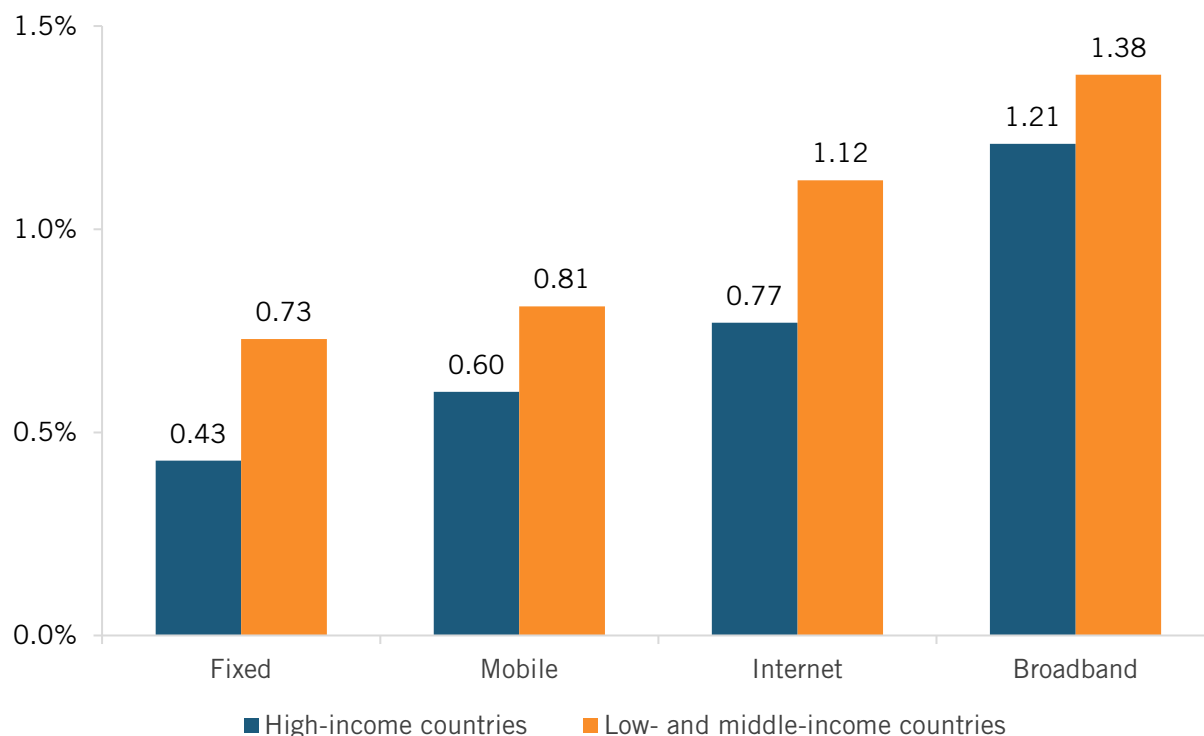
The vast majority of the economic benefits generated from ICT, especially in developing countries, stem from greater adoption of ICT across an economy.

This explains why multiple academic studies find strong linkages between ICT consumption (i.e., usage) and economic growth. For example, a December 2010 World Bank report, “Kenya Economic Update,” finds that “ICT has been the main driver of Kenya’s economic growth over the last decade.”¹¹ Specifically, the report finds that ICTs were responsible for roughly one-quarter of Kenya’s GDP growth during the 2000s. Moreover, ICTs’ contribution to Kenyan economic growth only grew over time, with the ICT sector providing a more than six-times-greater contribution to Kenyan GDP in 2009 compared with 1999.¹² Similarly, ICT accounted for 38 percent of Chinese total factor productivity (TFP) growth and as much as 21 percent of Chinese GDP growth from 1980 to 2001.¹³ Likewise, Ahmed and Ridzuan further found “a positive contribution of ICT to economic growth” across eight East Asian countries: China, Japan, Korea, Indonesia, Malaysia, Philippines, Singapore, and Thailand.¹⁴ As Richard Heeks, professor of development informatics at the University of Manchester estimated, “ICTs will have contributed something like one-quarter of GDP growth in many developing countries during the first decade of the 21st century.”¹⁵

Indeed, as Farhadi, Ismail, and Fooladi wrote in their report, “Information and Communication Technology Use and Economic Growth,” “The more a country use[s] ICT, the greater is its economic growth.”¹⁶ The authors found that if countries improve their score on the “ICT Use Index” (which measures a country’s number of Internet users, fixed broadband Internet subscribers, and mobile phone subscriptions per 100 inhabitants), then their economic growth increases by 0.17 percent.¹⁷ The World Bank has likewise documented this effect, finding that a 10 percent increase in high-speed broadband Internet penetration adds 1.38 percent to annual per capita GDP growth in developing countries. Likewise, a 10 percent increase in mobile-phone penetration adds 0.81 percent to annual per capita GDP growth in developing countries.¹⁸ (See Figure 1.) That research has been corroborated by a study by Czernich et al. which analyzes the effects of broadband

infrastructure on economic growth for 25 Organization for Economic Cooperation and Development (OECD) countries from 1996 to 2007 and found that a 10 percent increase in a country's broadband penetration rate drives annual GDP per capita growth of 0.9 to 1.5 percent.¹⁹ More recently, studies have found that a 10 percent increase in mobile-device penetration increases productivity by 4.2 percentage points.²⁰

Figure 1: Impact of a 10 percent increase in key ICT penetration on annual percent GDP growth²¹



Indeed, evidence that an expanding base of ICT capital stock powers countries' economic growth increasingly comes from all quarters of the world.²² For the Mideast, Nasab and Aghaei investigated the impact of ICT investments on economic growth in seven Organization of the Petroleum Exporting Countries (OPEC) nations from 1990 to 2007, finding that ICT "has a significant positive impact on economic growth in the sampled countries," and underlining the need for countries to adopt proactive policies to encourage ICT investments to boost economic growth.²³ Veeramacheneni, Ekanayake, and Vogel analyzed 10 Latin American countries from 1975–2003 seeking a causal relationship between ICT and economic growth, and found a two-way causality between ICT and economic growth in two-thirds of the countries and, moreover, that ICT contributed to economic growth in 8 of the 10 countries included in the sample.²⁴ Zagorchev, Vasconcellos, and Bae, in a study of eight Central and Eastern European countries from 1997–2004, found that financial development and increased investment in telecommunications technology contributed significantly to GDP growth per capita.²⁵ Toader et al. analyzed the effect of using ICT infrastructure on economic growth in European Union countries over 18 years from 2000 to 2017 and found that an increase of 1 percent in the use of ICT infrastructure contributed to GDP per capita growth of between 0.0767 percent (fixed-broadband subscriptions) and 0.396 percent (mobile cell subscriptions).²⁶ On average, a 1 percent increase in ICT capital stock leads to a 0.06 percent increase in a country's GDP.

The Latest Evidence Regarding the Economic Growth Impacts From ICT

Despite this impressive body of evidence documenting the powerful impact of ICT on economic growth, some skeptics have questioned the extent to which ICT adoption can increase economic growth in developing nations, arguing that developing countries may lack human capital, governance, or other ICT-complementary factors or that their labor-to-capital cost ratio is too low, making it less economical to add ICT capital.²⁷ And some research conducted during the late 1990s and early 2000s did appear to suggest as much, or at least that ICTs' benefits were greater for developed economies. For instance, in 2004, economist Khuong Vu, in analyzing economic growth data between 1990 and 2000, suggested that "the results indicate that ICT plays a more important role in determining the output growth for the developed economies than for the developing ones."²⁸ Similarly, Ayoub Yousefi investigated whether ICT contributed to economic growth across 62 countries with different levels of development from 2000 to 2006, finding that ICT exerted a greater impact on GDP growth in upper-middle-income countries than in lower-income countries.²⁹

Developing nations' investments in telecommunications infrastructure are 10 to 40 percent more effective in generating economic growth than are similar investments made by developed countries.

However, while it may have been the case that, in earlier decades, developed countries realized higher rates of return from ICT investments than did developing countries, that is clearly no longer true. Analyzing ICT investments and economic growth from 1995 to 2010 for 59 countries across various stages of development, economist Thomas Niebel concluded that "the regressions for the subsamples of developing, emerging, and developed countries do not reveal a statistically significant difference of the output elasticity of ICT between these three country groups."³⁰ Niebel's estimates indicate that, on average, regardless of a country's development status, a 1 percent increase in ICT investment increases economic growth by 0.05 to 0.09 percent annually.³¹ Similarly, Majeed and Ayub explored how different ICT indicators influenced economic growth in 149 countries from 1980 to 2015, with the empirical results suggesting the use of ICT infrastructure had a positive and significant impact on economic growth.³²

And, in fact, it appears that ICT investments now generate higher returns than ever before. In analyzing 29 economic studies that isolate the rate of returns to ICT investment, Cardona, Kretschmer, and Strobel revealed that "ordering the studies by their average year of the data used for the estimation, we find a positive time trend."³³ Further evidence supports the contention that, going forward, developing countries stand to gain even more from adopting greater levels of ICT than do developed countries. For example, as the European Commission found, developing nations' investments in telecommunications infrastructure are 10 to 40 percent more effective in generating economic growth than are similar investments made by developed countries.³⁴

Put simply, a growing body of evidence documents the positive effects ICT has on economic growth, for both developed and developing countries. Summarizing 58 empirical studies estimating the economic impact of ICT, Stanley, Doucouliagos, and Steel found that "on average, these technologies have contributed positively to growth."³⁵ In terms of the magnitude to which ICT spurs economic growth, a review of econometric literature by Cardona, Kretschmer, and Strobel finds that, on average, an increase in ICT capital stock of 1 percent leads to a 0.06 percent increase in a country's GDP.³⁶

PREVIEW OF GTIPA CASE STUDIES

Countries are implementing digital deployment and inclusion initiatives based on the specific needs and challenges of their respective economy and society. Some initiatives take the form of nationwide programs where collaborations with government institutions seek to enhance the digitalization of sectors such as agriculture, finance, or manufacturing in addition to empowering workforces through education and training. Some countries are more focused on supporting SMEs, as they constitute the dominant share of enterprises in almost all countries. Additionally, in many cases digital inclusion in a country means mitigating digital divides that can be attributed to issues such as Internet affordability or a lack of digital literacy. The following themes were prevalent throughout the case studies: deploying ICT infrastructure; promoting ICT adoption; advancing SMEs' use of digital tools; empowering women; and promoting agriculture and food security.

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Deploying ICT Infrastructure

To improve international connectivity, national broadband programs have played a major role in deploying infrastructure. Specifically, the implementation of telecommunication towers and cable landing stations have provided increased Internet access for government institutions. Based on the geographic location of these structures, remote areas and underserved communities can benefit immensely. This will enhance digital literacy and provide new educational and economic opportunities. However, for certain countries that already possess a significant competitive advantage, their objectives will be different. Moreover, governments have set goals for all their citizens to have access to high-speed Internet connectivity by certain deadlines. These grand statements are meant to promote competition in various tech sectors and encourage the private sector to invest in new digital infrastructure. Additionally, some countries' measures focus on improving the wireless communication capabilities of federal agencies. These are particularly notable in emergency and defense capacities where 24/7 communication is vital for operating.

Examples:

1. In South Africa, the **Telkom Connected Schools Program (CSP)** has provided Internet access to over 800 schools across south Africa since its inception in 1998.
2. As part of Ireland's **National Broadband Program**, the country has implemented extensive infrastructure development. This includes laying 140,000 kilometers of fibre cable and utilizing over 1.5 million poles, covering 96 percent of Ireland's land mass.
3. As part of Hungary's **National Digitalization Strategy 2022–2030**, one of its four pillars focuses on digital infrastructure through the enhancement of gigabit networks. Moreover, the nationwide initiative aims to develop national networks by expanding Internet bandwidth across the country.
4. In Canada, the Canadian Radio-Television and Telecommunications Commission has established the **Broadband Fund** to help provide all Canadians with access to broadband Internet and mobile wireless services.³⁷ During its first five years of operation, up to \$675 million will be available for projects that help achieve this goal.

Promoting ICT Adoption

Promoting ICT adoption is an imperative for all nations. In some countries, government agencies have created ministries dedicated to ICT-related activities. Under this institution, federal programs have improved ICT adoption by providing thorough training at hundreds of digital centers. Additionally, this training has also empowered disabled communities. Barriers to access caused by financial and/or physical implications mean that significant proportions of those with a disability do not use the Internet or other online applications in certain countries. At the nonprofit level, efforts toward inclusivity for those that find it difficult to utilize certain digital tools have been made possible through free workshops with experts who provide solutions. Therefore, individuals can acquire a variety of digital knowledge that may not have been made previously available, leading to more easily accessible information services and more efficient living circumstances. Meanwhile, less-developed nations are beginning to catch on to the benefits of investing in ICT infrastructure. The digital divide across African countries is most prevalent with limited 5G networks in place and inconsistent access to the Internet. However, certain nations have shown a desire to direct more investments toward ICT, despite bureaucratic hurdles. Numerous public-private sector partnerships have brought ICT systems to hundreds of schools in rural locations. Based on the general consensus that international trade is powered by the internet, there is much potential for improvement in this sector. For more-developed nations, ICT infrastructure has resulted in the modernization of government services. Digital citizenship has become increasingly familiar in certain countries where citizens can manage their affairs using mobile applications that have all the necessary IT and cybersecurity features.

Examples:

1. The **National Fibre Optic Backbone** initiative and the **e-Transform Project** program have both resulted in significant growth in Ghana's technology infrastructure. These government-run initiatives are meant to extend broadband connections across the country, particularly benefiting rural locations, and helping bridge the gap between businesses.
2. In 2015, the **Tech4ED Program** created by the government of the Philippines was created within the Department of Information and Communications Technology's (DICT's) Competency Development Bureau to provide ICT equipment and digital literacy to communities. It offers digital skills training, including basic and intermediate digital literacy, capacity building for policymakers, and training for micro, small, and medium enterprises.
3. In South Korea, the Ministry of Science and ICT implemented the **Digital Capacity Building Program**. This initiative has provided extensive digital training for about 2.87 million people across more than 900 training centers nationwide.
4. In May 2023, an updated and upgraded version of Ukraine's **Diia.Education digital platform** was designed to close the digital divide in Ukraine by offering free, engaging content to help individuals develop the skills needed to thrive in an increasingly digital world.
5. In California, the governor recently signed an **Executive Order directing state agencies to leverage AI** and separately launched a partnership to train 100,000 students, college faculty, developers, and data scientists.

Advancing SMEs' Use of Digital Tools

The significant digital adoption gap between large conglomerates and SMEs in most countries has hindered nations' economic productivity and global competitiveness. Therefore, it has become increasingly crucial for SMEs to digitalize their business operations. Certain governments have the capacity to provide financial support in the form of grants and subsidies that allow SMEs to acquire necessary equipment and consulting services. However, when it comes to having the bandwidth to experiment with new technologies, many SMEs lack the capital to take such a risk. This has become a recurring predicament, as these businesses are discouraged from investing because of high costs. In response, voucher programs have served as a safety net to lower the burden these financial risks might cause. Depending on the company, specific digital needs will be different, and certain countries might not have the ability to create specialized funds that will cater only toward one or two issues. This is why some programs have been structured as more of a comprehensive package including but not limited to financial technology support (fintech), digital marketing platforms and e-commerce solutions. Additionally, SME digitalization also extends to improvements in cybersecurity measures. These initiatives are meant to educate businesses on how to respond to cyber-attacks and information services that will inform the user of impending cyber risks that pose a danger to company servers and databases.



Examples:

1. Poland has introduced a number of efforts to promote SME digitalization, including the **Smart Growth Operational Programme (POIR)**, an **Innovation Voucher** program, a Cybersecurity for SMEs program, and the **Industry 4.0 initiative**, managed by the Polish Agency for Enterprise Development and which has been designed to help SMEs adopt advanced manufacturing technologies.
2. In South Korea, the **Digital Transformation CEO Academy** program targets SME leaders by offering training that emphasizes the importance of digital transformation, leadership, and organizational change. Company CEOs learn strategies for implementing digital tools into their business models, thus fostering a top-down approach toward increased digital adoption.
3. In Germany, the **Mittelstand-Digital Innovation Hubs** represent a free resource that provides digital solutions to SMEs by offering trainings on digital technologies for company employees. Across their 28 hubs, Mittelstand-Digital has a regional or industry-specific focus and are distributed throughout Germany in a regional network.

Empowering Women

Due to the ongoing digital gender gap in various countries, women are less represented in digital professions. When it comes to working on advanced software and technology platforms, there exists a noticeable divide among male and female participants. This has a negative impact on economic development as countries experience a missed opportunity for significant GDP growth. Thus, it's incredibly important to create opportunities that will incentivize more women to join the tech industry in some capacity. In response to these deficiencies, there have been numerous programs created to enhance education, training, and job opportunities to equip women with the necessary digital skills to contribute to progress in digitalization. Government institutions in Europe and Asia are particularly noted for launching free training programs to combat these inequities with the goal of impacting hundreds of women during each training. Artificial intelligence and data annotation have become a specific priority in these programs due to an ever-increasing hiring demand in these sectors. In addition to trainings, leading female professionals in various tech sectors have been called upon to generate more awareness about the need for digital inclusion in their industries as well as providing insights on the world of digital labor. This has often been showcased in seminars attended by politicians, non-governmental organization (NGO) representatives, and other digital professionals where the focus is on showing women how to navigate the industry and build a sustainable career.



Examples:

1. **#SheTransformsIT**, based out of Germany, works to close the ongoing digital gender gap as it is detrimental to the nation's productivity and showcases a tremendous missed opportunity for billions of dollars in GDP growth. Training programs and seminars led by industry experts provide the necessary resources and digital tools for women to break into various tech fields.
2. In the Philippines, the **WeEmpowerAsia Program** aims to address resources for digital inclusion of Filipino women. In collaboration with the European Union and UN Women, the program provides training on transitioning businesses online, improving IT skills, and leveraging online work opportunities.
3. The **WeTrainWeMatch Program**, based out of the Philippines, connects female entrepreneurs and digital marketing professionals to equip them with technological skills and connect them to relevant job opportunities. This partnership with the Department of Information and Communications Technology (DICT) helps foster inclusion in the digital and entrepreneurial spheres.

Promoting Agriculture and Food Security

Digital transformation in agriculture has been pursued in numerous ways to increase productivity and efficiency in farming operations and enhance economic opportunities in rural areas. Practices such as crop monitoring and pesticide applications are vital to the sustainability of farms and require constant upkeep and maintenance. The introduction of drones and other AI-powered technology has improved performance quality and reduced the production and input costs that are attached to these responsibilities. Environmental and weather conditions that certain farms must

endure depending on the time of year have an egregious effect on food security for certain populations. Therefore, these technologies are a beacon of stability and reassurance for farmers who rely on their crops for daily nourishment. Moreover, there exist significant opportunities for agriculture professionals to contribute to the digital economy through various technological resources. Digital innovation hubs and virtual call centers allow farmers to exchange educational resources on their respective disciplines allowing for market access and competition within the industry. Smallholder farmers especially benefit as rural populations will be able to have a consistent flow of products needed for daily operations. Additionally, digital supply chain platforms have become a popular resource. They make transactions between parties simpler and allow product producers the ability to trade and sell commodities in real time.

Examples:

1. Based in Australia, **FluroSat** is an agriculture tech company whose analytics engine utilizes remote sensing pictures, local weather data, and sophisticated models to monitor crop health. Using data-driven insights, farmers will be able to optimize their product efficacy and ensure the sustainability of their crop fields.
2. The Bangladesh-based **Digital Village Initiative** aims to incentivize rural digitalization by establishing digital hubs in rural areas. Moreover, it implements virtual call centers allowing for the exchange of information between farmers and manufacturers, which ultimately bridges the digital divide and fosters economic opportunities for rural populations.
3. The **Agri-Tech Innovation Initiative**, based out of Canada, allocates up to \$25 million for eligible farms and food processing businesses to increase their production and consumption of locally grown food. This program is one of the numerous facets of the Sustainable Agricultural Partnership, a \$3.5 billion agreement between federal, territorial, and provincial governments aimed to foster market competition across the agriculture industry.

AUSTRALIA: AUSTRALIA'S DIGITAL DRIVE: INNOVATION AND TECHNOLOGY

Institute for Policy, Advocacy, and Governance (IPAG) Asia Pacific

Syed Munir Khasru

Australia's digital landscape presents both significant achievements and ongoing challenges, particularly for those who are socioeconomically disadvantaged, elderly, or living in rural and remote areas. Despite incremental improvements, digital inclusivity remains unequal, with substantial gaps in access, affordability, and digital skills. According to the Australian Digital Inclusion Index (ADII), overall digital inclusion improved to an index score of 73.2 in 2023, up from 71.1 in 2021.³⁸ Nevertheless, nearly one-quarter of Australians experience some level of digital exclusion, with particularly low scores among the elderly, citizens with disabilities, and those in public housing. Addressing these disparities requires targeted, multi-faceted approaches that account for the unique needs of these groups.

Expanding Access to Quality Digital Infrastructure in Remote and Regional Areas

One of the foundational barriers to digital inclusion is access to high-quality infrastructure, particularly in remote and regional areas. While access scores have increased nationally to 72.0, rural and remote areas continue to experience substantial digital exclusion compared to metropolitan regions, where the score averages 74.8. In non-metropolitan areas, the average score is notably lower, largely due to insufficient infrastructure. This gap is most pronounced in the Northern Territory, where digital inclusion lags due to connectivity limitations, exacerbating the difficulties faced by residents, especially those within remote Indigenous communities.³⁹

To address this, a collaborative approach involving both government and private-sector entities could help expand broadband infrastructure in underserved regions. The federal government, alongside telecommunications companies, could prioritize the deployment of robust broadband infrastructure, such as fiber optic and satellite networks, to increase reliability and speed in underserved locations. Remote and very remote areas, where Indigenous communities are heavily represented, stand to benefit significantly from such developments. In these areas, Indigenous communities have digital inclusion scores up to 37 points lower than non-Indigenous populations in urban centers.⁴⁰ Establishing community-based access points, which provide shared digital resources in partnership with local Indigenous councils, could also ensure sustainable access and enable more residents to participate actively in the digital economy.

Enhancing Digital Literacy and Skills Through Targeted Training Programs

Digital skills, collectively measured by the ADII as "Digital Ability," form another crucial pillar of digital inclusion. ADII's findings show that certain demographics, particularly lower-income groups and older adults, have limited digital skills, inhibiting their ability to leverage the Internet's benefits fully. Those in the lowest-income quintile, as well as citizens aged over 75, show particularly low digital ability scores. These groups often lack the essential digital literacy needed to access online health services, job applications, and government portals effectively.⁴¹

To enhance digital skills, it's essential to establish accessible digital literacy programs that cater to the unique needs of these groups. Government-supported community workshops, offered through libraries, local councils, and senior centers, can provide a foundational digital education for older Australians. For economically disadvantaged groups, digital literacy programs offered by non-profit organizations, particularly those operating in partnership with educational institutions,

can help bridge this gap. The Good Things Foundation, for instance, has made strides in delivering free, community-based digital training across Australia. Such programs should focus on basic digital skills, safe Internet practices, and efficient navigation of essential online services like telehealth and job application portals.

Digital literacy programs for First Nations communities should be culturally tailored, recognizing that language and traditional knowledge systems play a role in effective learning. Programs incorporating Indigenous languages and culturally relevant content could make digital literacy training more inclusive and relevant for Indigenous Australians in remote areas.⁴²

Promoting Multi-Device Access to Address Mobile-Only Usage Limitations

An increasing share of Australians, particularly those in low-income and rural communities, depend solely on mobile devices for Internet access—approximately 10.5 percent nationwide, with higher rates among First Nations people (21.3 percent) and individuals in remote areas (32.6 percent). Mobile-only access constrains users from basic online activities, limiting their ability to participate in more complex digital tasks like online education and job applications.

To address these constraints, access to affordable multi-device setups is essential. Community driven device-sharing programs, such as local libraries and community centers offering laptops or tablets for temporary use, can broaden access for mobile-only users. Telecommunications providers could further support this by offering bundled, affordable multi-device plans for low-income households and public housing residents. Partnerships with tech companies to supply refurbished devices at reduced or no cost can also bridge the access gap, providing economically disadvantaged individuals with greater digital engagement opportunities.

Conclusion: Toward a More Inclusive Digital Future

As digitalization increasingly permeates all aspects of social, economic, and cultural life in Australia, achieving universal digital inclusion becomes paramount. While the 2023 ADII reports national improvements, persistent digital divides suggest that substantial work remains to create equitable access to digital resources across demographics and geographies. Expanding infrastructure in rural and remote areas, introducing affordability measures, enhancing digital literacy, and ensuring access to multi-device setups form a comprehensive approach to addressing these challenges.

These strategies are not isolated solutions but interdependent actions that require coordinated efforts across government, private sector, and community organizations. Policies that promote digital equity, such as digital skills development programs and affordable pricing models, will be crucial in addressing the multifaceted nature of digital exclusion. Addressing digital inclusion is not only about technological equity but also about fostering social and economic empowerment for all Australians.

BANGLADESH: THREE IDEAS TO BOOST DIGITAL INCLUSIVITY IN BANGLADESH

IPAG

Rubayat E Shams Anik and Fatema Tuj Johora Konka

Digital inclusivity remains a critical challenge in Bangladesh, where millions still lack internet access and its associated benefits. With over 170 million people, bridging the digital divide is crucial for reducing socio-economic inequalities. Women, rural communities, and low-income groups are disproportionately affected.⁴³ To ensure broader access to digital opportunities, targeted policies and programs are essential. This article explores three key strategies to enhance digital inclusivity in Bangladesh.

Promoting Digital Literacy Programs Targeted at Marginalized Groups

Digital literacy is essential for accessing the benefits of digital technologies, but many in Bangladesh, especially women, rural residents, and low-income groups, lack these skills. A 2020 Global System for Mobile Communications (GSMA) report highlights that women in Bangladesh are 29 percent less likely to own a mobile phone and 52 percent less likely to use mobile Internet than men.⁴⁴ To address this gap, the government and civil society should invest in targeted digital literacy programs, covering both basic and advanced skills such as digital financial literacy, cybersecurity, and e-commerce navigation.

One approach to promoting digital literacy is through the establishment of community-based digital learning centers.⁴⁵ These centers could provide free or low-cost courses in local languages to teach individuals how to use digital tools and access information online. The centers could be located in rural areas, schools, and community centers, making them easily accessible to those most in need. In India, for instance, the National Digital Literacy Mission (NDLM) has successfully implemented digital literacy training in underserved areas, which Bangladesh could emulate.⁴⁶

Additionally, promoting digital literacy in schools is critical for long-term inclusivity. Incorporating digital skills into the national curriculum will ensure that future generations are prepared to participate in the digital economy. Partnerships between the government, private sector, and educational institutions can facilitate the deployment of affordable digital devices and provide teacher training programs to help integrate technology into classrooms.

To ensure the participation of women and girls into digital literacy programs, targeted outreach campaigns must be conducted. Offering digital literacy programs in women-friendly environments or providing mobile training units that travel to different communities could help mitigate these barriers. A study conducted by the GSMA found that digital literacy programs targeted specifically at women in South Asia can improve not only their digital skills but also their economic opportunities.⁴⁷

Mobile-Based Solutions for Financial Inclusion

Despite the proliferation of mobile phones, many Bangladeshis remain outside the formal banking system. It's found that around 45 percent of adults in the country don't have access to formal financial services, with rural areas having even lower access.⁴⁸ Moreover, traditional banks are often located far from rural areas, making it difficult for people in these regions to access financial services.

Mobile financial services (MFS) can bridge this gap by providing low-cost, easily accessible financial solutions for unbanked and underbanked populations. Services like bKash, one of the largest mobile money platforms in Bangladesh, have already shown how transformative mobile banking can be. By leveraging mobile phones, individuals can make payments, transfer money, and even access microloans without having to visit a bank.⁴⁹ Expanding the reach of such services can significantly boost financial inclusivity, which, in turn, will foster greater digital inclusion.

Educational campaigns aimed at rural and low-income populations can help overcome the mistrust or lack of familiarity many people have with digital financial tools. Moreover, regulatory reforms could encourage greater competition in the mobile financial services sector, thereby reducing fees and making these services more attractive to low-income users.

Integrating MFS with other digital platforms, such as e-commerce or e-government services, can also increase the utility of digital financial tools. Encouraging innovation in this space, such as mobile-based credit scoring or microinsurance products, could open up even more opportunities for financial inclusion.

Enhancing E-Government Services for Inclusive Access to Public Resources

Expanding and improving e-government services represents another key aspect worth exploring. These digital platforms provide citizens access to critical public services, such as healthcare, education, social protection, and legal documentation, regardless of location. However, gaps remain in infrastructure, particularly in rural areas, where Internet connectivity and digital literacy remain limited.⁵⁰ To address these challenges, Bangladesh must prioritize expanding broadband and mobile network coverage, especially in underserved regions, through public-private partnerships (PPPs).

Localization is highly critical for inclusivity, making services user-friendly for all citizens, especially those with limited digital skills.⁵¹ Platforms should be available in local languages, like Bangla, and mobile apps designed for easy navigation. Services like scheduling medical appointments or accessing agricultural support should be accessible to rural populations with limited digital proficiency.

Promoting digital ID systems, such as biometric national IDs (NIDs), can also enhance equitable access to e-government services. However, many rural citizens remain unregistered due to technological barriers. The government can facilitate mobile registration units and educate citizens on the benefits of digital IDs to increase their usage.

Addressing concerns around data privacy and security is another critical step. Many citizens, especially those new to the digital world, are concerned about data misuse. Strengthening cybersecurity measures, establishing data protection laws, and ensuring transparency in data handling will help build trust in e-government services.

Conclusion

To achieve widespread digital inclusivity in Bangladesh, there needs to be a concerted effort to make Internet access affordable, strengthen digital infrastructure, and promote digital literacy among marginalized groups, and expand mobile financial services.

CANADA: POLICIES TO BRIDGE THE DIGITAL DIVIDE

Macdonald-Laurier Institute

Peter Copeland

Canada recognizes that, in the post-COVID era, its focus must be on building a better future by fostering competitiveness, especially as data and information become key drivers of production. Innovation and technology have the capacity to bridge the regional and demographic gaps between Canadians across all sectors of the economy. In 2021, the National Research Council of Canada (NRC) convened an informal working group of 40 thought leaders to identify areas of potential development over the next 10 to 15 years. The six broad categories highlighted in this 2030-2035 "horizon scan" were resource futures, big data and AI, cybersecurity and privacy, healthcare futures, climate change, and new models of innovation.⁵²

This write-up underscores Canada's recent efforts in recognizing the significant challenges it faces and its attempts to pursue opportunities outlined in the government's "horizon scan" of its technology future. Some examples of these opportunities will be presented below, which broadly fall under the horizon scan. (Note: Currencies shown in this case study reflect Canadian dollars.)

Innovation and Food Security

Through the Agri-Tech Innovation Initiative, up to \$25 million will be allocated to eligible farm and food processing businesses to increase the production and consumption of locally grown food in the province by 30 percent by 2032.⁵³ This will support qualified businesses in funding innovative technology, equipment, or processes that enhance efficiency or expand operations. This initiative is part of the Sustainable Agricultural Partnership, a \$3.5 billion agreement between federal, territorial, and provincial governments aimed at fostering competitiveness and resilience in the agri-food industry.⁵⁴

In addition to the Initiative, the outcomes observed so far indicate an increased sustainability factor in Canadian agricultural production through innovation. Canadian farmers have embraced the growth of genetically modified (GM) crops, thereby reducing the need for tillage. Canada has also adopted plant breeding technologies to enhance agricultural efficiency. Finally, Canadian farmers have demonstrated their ability to produce more food with fewer inputs.⁵⁵

Machine Learning Medical Devices

In 2023, Health Canada released a draft titled "Pre-market Guidance for Machine Learning-Enabled Medical Devices," outlining its expectations for the safe operation of such devices. The draft also introduces a process for pre-approving anticipated modifications to machine learning-enabled devices through the use of a predetermined change control plan, allowing for proactive risk management.⁵⁶ These devices possess the ability to revolutionize the healthcare sector. Health Canada has already approved some of its applications. Some of these include:

- **Critical Care Suite (GE Healthcare):** This refers to a collection of AI algorithms incorporated in an X-ray device, which would reduce the time a radiologist needs to review a type of a collapsed lung.
- **Advanced intelligent Clear-IQ Engine (AiCE) for Magnetic Resonance (MR) (CANON MEDICAL SYSTEMS CORPORATION):** This refers to the world's first MR Deep Learning reconstruction

technology. It is accountable for the production of fast and detailed MR images which covers all regions of the body.

Broadband

Broadband access challenges exist in Canada, the world's second largest country in terms of landmass with many remote and rural communities whose geography poses unique logistical, technological, and financial challenges to comprehensive coverage. The Canadian telecom sector is also not as competitive as other countries', resulting in higher costs and lower quality for consumers.⁵⁷ The Canadian Radio-Television and Telecommunications Commission (CRTC) has established the Broadband Fund to help provide all Canadians with access to broadband Internet and mobile wireless services.⁵⁸ During its first five years of operation, up to \$675 million will be available for projects that help achieve this goal. It will be important for the federal government to coordinate with the provinces to ensure regulations are aligned and not duplicative. Canadian governments should focus on creating incentives for private investment, rather than making substantial government investments tied to specific technologies and objectives, which can deter private investment.

Digital Economy and Technology

AI: The EU's Digital Markets Act has taken a broad approach to AI regulation. In considering which approach to take, Canada may look to the European Union, or take a more cautious and targeted approach, trying not to overregulate too quickly, stifling innovation in a growing sector and a more targeted one, by regulating AI applications in the different contexts and sectors in which it is embedded.⁵⁹ Policymakers need to grapple with what are the best ways to address health, social, and lifestyle negative externalities resulting from pervasive technology use, addictive and manipulative algorithms, and the attention economy. They will need to ask what the role of government and that of the market, individual, and civil society should be in confronting this challenge.

Digital Services Tax (DST) & Canada-US-Mexico Agreement (CUSMA): In June 2024, Canada introduced a Digital Services Tax (DST)—a 3 percent tax on Canadian-source digital services revenue earned by large domestic and foreign taxpayers.⁶⁰ With the DST, Canada is moving on its own, not with other OECD countries. Firms have indicated that the prices will be passed on to consumers, and the United States has said that it will retaliate, likely in the upcoming trade negotiations between Canada and the United States. The question remains as to how this policy will affect innovation and investment in Canada, but it seems likely that it could hinder it.⁶¹

Online Streaming Act: Canada's federal government introduced the Online Streaming Act in April 2023.⁶² The Act's taxes on foreign streaming services may have an impact on innovation and enterprises' bottom lines, with prices being passed on to consumers.

Cybersecurity and Data Privacy

The National Cyber Security Action Plan (2019–2024) focuses on the prevention, response, and mitigation of cyber threats through the development of a resilient digital landscape. Supported by significant investments, the plan aims to enhance the finance and energy sectors by working in coordination with the Cyber Centre, while also improving integrated threat assessments to address the Centre's expanding client base.⁶³

Given the above and Canada's history of various past initiatives, there is hope for cooperation with AUKUS, the trilateral partnership between Australia, the United Kingdom, and the United States. AUKUS has three main pillars, and Canada could seamlessly contribute to the second and third.⁶⁴ The second pillar involves collaboration on emerging technologies, while the third focuses on the production of military-related equipment. Canada's investment in the National Cyber Security Action Plan would facilitate its integration with AUKUS initiatives. Additionally, Canada has the manufacturing capacity to enhance the production of legacy military capabilities.

Rare Diseases and Novel Technology Development

Canada has launched its first National Strategy for Drugs for Rare Diseases to improve access and affordability of treatments for rare conditions. Through bilateral agreements with provincial and territorial governments, the strategy aims to enforce early diagnosis, screening, and access to new drugs. Additional funding will be allocated to building efficient research and national governance structures to advance innovation in rare disease treatment. First Nations and Inuit patients will also receive dedicated funding to support their healthcare access needs.⁶⁵

Although this represents a significant first step toward improving access to treatment for Canadians diagnosed with rare diseases, several enhancements could be made to the strategy.⁶⁶ In particular:

- Incentives such as time-limited market exclusivity provisions, support for data protection of new uses for existing medicines, and funding for developers are essential. While the strategy may lead to lower drug prices, it might not be considered worthwhile for developers, who may respond by opting out of the Canadian market.
- Less-restrictive criteria for patients to obtain coverage should also be a priority for enforcement.
- A measure supporting all government drug plans to list all rare disorder medications following successful price negotiations within a short timeframe is further recommended.

Trade Policy

2022 marked the launch of the Indo-Pacific Strategy, centered around five core objectives: promoting peace, resilience, and security; expanding trade, investment, and supply chain resilience; investing in and connecting with people; building a sustainable and green future; and positioning Canada as an active and engaged partner.⁶⁷ Each objective is supported by comprehensive initiatives and involves the collaboration of multiple governments to achieve desired goals. Due to the extensive nature of these initiatives and partnerships, not all of it can be discussed here. Instead, two relevant ongoing projects will be highlighted in line with this case study's focus.⁶⁸

- Export Development Canada's (EDC) 2023 Annual Report highlights its support for over 27,000 Canadian businesses, particularly SMEs, facilitating \$131.4 billion in exports and investments while expanding efforts in Indo-Pacific markets. Despite economic challenges, EDC generated \$1.6 billion in net revenue, though net income fell to \$450 million due to increased credit loss provisions.
- Canada confirms the opening of a new FinDev Canada office in the Indo-Pacific region in 2023 to drive economic growth with a focus on supporting renewable energy, transportation, water, and digital infrastructure solutions.

“Colombia Potencia Digital” Strategy

The Colombian ICT Ministry (MinTIC) has released a strategy seeking to turn Colombia into a regional digital power. The plan will accelerate the innovation and digital transformation ecosystems of the country with an investment of over \$450 million from 2024 to 2026. The strategy strives to articulate the different tech capabilities currently deployed in the country and to articulate and strengthen the nation’s digital ecosystems through the implementation of metrics and governance frameworks.

To achieve this, the strategy will coordinate key stakeholders such as the government, private sector, entrepreneurs, investors, academia, and civil society in tackling regional challenges and providing solutions with regional impact, seeking to decentralize the positive effects of emerging technologies around the different regions of Colombia.

The strategy is built upon three pillars: 1) **Connectivity:** To accelerate and strengthen the adoption and appropriation of connectivity, Digital Centers will be built in the 32 regions of Colombia to guarantee uninterrupted connectivity by 2032; 2) **Education:** To train a million people on ICT skills, as a means to develop technical capabilities and promote productivity; and 3) **Ecosystems:** To strengthen the articulation of the digital ecosystems in the country to promote productivity and the export capabilities of the country.

Integral Digital Connectivity Expansion Plan

The Colombian MinTIC developed the Integral Digital Connectivity Expansion Plan that lays out the following tasks to bridge the digital divide in Colombia:

1. Connect vulnerable and remote areas, as well as improving the coverage and quality of telecom services through different technologies.
2. Use Internet and digital technologies as tools for social transformation.
3. Rolling out telecom infrastructure to improve connectivity and deploying submarine cables, optic fiber, and satellite technologies, through co-investment of the government and the private sector.
4. Remove administrative barriers for the deployment of telecom networks and infrastructure.
5. Create measures and conditions for radio spectrum allocation that promote its efficient use and social wellbeing.
6. Strengthen small Internet Service Providers (ISP) to bridge the digital divide in the regions of Colombia.

Artificial Intelligence Microcenters

As part of the AI national strategy, the Colombian ICT Ministry will build and provide equipment for 100 AI Microcenters that will be situated in different municipalities around Colombia. They will have free Internet access, computers, and training rooms to teach people from all age groups

about AI and tools for tech development. This will allow Colombia to skill up populations from all over the country in emerging technologies and foster regional digital ecosystems that can support the appropriation and development of AI in Colombia.

GERMANY: POLICIES TO PROMOTE DIGITALIZATION OF THE GERMAN ECONOMY

German Economic Institute

Barbara Engels and Jan Büchel

Digitalization offers numerous advantages for companies of all kinds. For example, using digital data can help companies save costs, make production processes more efficient, develop more customized products, and remain competitive. However, up to today, there are considerable differences in the degree of digitalization depending on company size. For example, in Germany, SMEs with fewer than 250 employees are a lot less digitalized than larger companies.⁶⁹

In small enterprises, for example, fewer employees work in digitalization professions and less IT-related training is offered.⁷⁰ For medium-sized companies, untapped potential lies in developing digital products or intensifying research and innovation activities.⁷¹ SMEs usually have fewer financial resources and opportunities for cross-financing than larger companies. This can result in digitalization projects being implemented less often.

Mittelstand-Digital Initiative

With the Mittelstand-Digital initiative introduced by the Federal Ministry for Economic Affairs and Climate Action (BMWK) the German government addresses precisely the issue that smaller companies do not harness many opportunities of digitalization yet.⁷² The initiative supports SMEs in their digital transformation efforts based on the three following pillars:

- **The Mittelstand-Digital Innovation Hubs** support SMEs free of charge in identifying and implementing suitable digital solutions. They offer trainings on digital technologies for SME employees. The 28 hubs have a regional or industry-specific focus and are distributed throughout Germany in a regional network.⁷³ Through the Hubs, SMEs can gain insights into practical examples of how digitalization projects like AI installations are implemented in other companies from the same sector and what added value they can bring.⁷⁴
- **The Digital Now** investment grant program provides SME with financial support for investments in digital technology like required software or hardware and digital skills among their workforces.
- **The Cybersecurity for SMEs** initiative provides tailored services to support SMEs in improving their cybersecurity. This includes information services on cyber risks and support on how to deal with the dangers posed by cyberattacks.

PIKSL

80 percent of individuals in Germany over the age of 14 use the Internet daily.⁷⁵ However, there are also social groups that use the Internet only rarely or even not at all, because access to digital applications is complicated for them. For example, people with disabilities might find it difficult to acquire digital skills because many digital applications are not barrier-free. Receiving and sending emails or text messages via messenger, posting photos on social networks, or reading news—all these things that are part of everyday life for many people are more difficult for people with disabilities. A survey from Austria among 550 individuals with and without disabilities aged 20 to 49 years shows that 45 percent of people with disabilities do not use the Internet (people

without disabilities: only 2 percent) and 17 percent of people with disabilities do not use digital end devices such as smart phones or tablets (people without disabilities: 0 percent).⁷⁶ The reason often given by citizens with disabilities is that they were unable to use digital end devices or were not familiar with certain digital end devices.⁷⁷ Unfortunately, inclusive teaching and learning materials that people with disabilities could use to build up digital skills are rare. Advancing digital literacy and enhancing digital inclusivity is thus of great importance.

PIKSL is a non-profit initiative in Germany that promotes digital inclusivity.⁷⁸ Its aim is to offer barrier-free access to the information resources of our time for people with disabilities. In 14 labs across Germany, people with disabilities can try out and explore digital media independently or with professional support: from the first steps on a personal computer (PC) and tablet to the independent design of media products.⁷⁹ A central aspect is active co-design: Barrier-free solutions are developed inclusively with and according to the needs of people with difficulties. Everyone can participate in the labs.

In addition to the labs, PIKSL offers workshops for people with and without disabilities to get started and to deepen their knowledge of the digital world. A mobile service is also provided where experts come to institutions for people with disabilities and teach digital skills to the employees.⁸⁰

#SheTransformsIT

Women—and thus half the population—participate much less in the opportunities of digitalization than men. The proportion of women in digitalization professions in Germany, for example, is only 16 percent.⁸¹ Although women and men work on computers with similar frequency, there are significant differences in the use of advanced and specialized software and in the use of networked digital technologies such as cloud services.⁸² This digital gender gap means less participation and prosperity for women and thus for society. The digital gender gap is also detrimental to the economy: It slows down economic development. Europe's gross domestic product (GDP) could increase by 260 to 600 billion euros if the proportion of women in tech jobs doubled by 2027.⁸³ In order to make sustainable use of the opportunities of digitalization, women need to be much more involved in it. This is all the more important since technology is by no means neutral. For example, algorithms perpetuate stereotypes to the detriment of women and other groups. This exacerbates existing inequalities.

The German #SheTransformsIT initiative works toward structural changes to get girls and women excited about digitalization and to strengthen their position in digitalization.⁸⁴ The initiative, which was founded in 2020, sees itself as the network of networks. #SheTransformsIT wants to connect relevant female actors and demonstrate pathways into digital careers. The initiative brings together digital politicians from political parties, representatives of large companies, academics and digital designers from civil society, non-governmental organizations (NGOs), foundations, and associations. The breadth of the project network makes it possible to look at more than just the education sector, the economy, or universities in detail, but to advocate for cross-border system change.

There are already many initiatives in Germany that support girls and women in digitalization. The #SheTransformsIT initiative map makes these initiatives visible. One of the initiatives is the Female*Lead Accelerator, a 12-month leadership development programme for women.⁸⁵ Another

initiative is the blog IT girls from Hamburg, where two young women want to show other young women how they can get into the tech sector.⁸⁶ Currently, #SheTransformsIT runs a campaign called FRIDA (Frauen in der Digitalen Arbeitswelt—Women in the Digital World of Labour), which aims to make women in IT more visible and provide authentic insights into the digital world of labor.

GHANA: DIGITAL INCLUSIVITY IN GHANA: CURRENT EFFORTS AND POLICY RECOMMENDATIONS

IMANI Africa

Franklin Cudjoe

Introduction

Digital inclusion is defined as “equitable, meaningful, and safe access to use, lead, and design digital technologies, services, and associated opportunities for everyone, everywhere.”⁸⁷ Ghana over the last two decades has been on a fast incline when it comes to adopting and deploying digital inclusivity and the deployment of IT infrastructure as a critical driver of the economy and social development. Both the National Democratic Congress (NDC) and the New Patriotic Party (NPP) in the run-up to the 2024 general election have identified SMEs as the key target for digital inclusivity. Both parties have adopted a policy outlook that seeks to ensure that digital tools are leveraged to enhance the growth and competitiveness of SMEs.

Efforts to Expand Digital Inclusivity

Infrastructure

According to the 2022 Global Innovation Index (GII) report, Ghana ranked 93 among the 132 economies with a score of 72.4 when it came to access to ICT infrastructure.⁸⁸ Projects such as the National Fibre Optic Backbone and the e-Transform Project are testament to the work Ghana is putting in to grow its technology infrastructure. These projects by the government seek to extend broadband connections across the country, particularly to underserved rural locations, and help bridge the gap between businesses.

Digital Literacy and Skill Training

Digital literacy is pivotal when it comes to enabling the citizenry in an economy that needs digital skills. The NDC’s manifesto proposes key policies that seek to establish a digital skills program aimed at equipping SMEs to thrive in the digital space.⁸⁹ The NPP administration similarly is introducing programs like the Digital Skills for Africa initiative, which seeks to help provide digital training and certification to entrepreneurs.⁹⁰

Digital Support for SMEs

The incumbent NPP government has developed a digital program implemented by the Ghana Enterprise Agency to provide SMEs with a set of resources that will enable the quick integration of digital technologies in core business operations. This provides access to digital marketing platforms, e-commerce solutions, and fintech support as a composite package.⁹¹

The NDC proposes a SME Digital Support Fund to assist SMEs seeking technical and financial support. The proposed initiative aims to remove the barriers that SMEs face in adopting digitalization, with a key focus economic sectors being manufacturing and agriculture.⁹²

Policy Recommendations

Prioritize Infrastructure Investment for Digital Inclusivity

Innovative investment vehicles should be examined to subsidize the cost of data and fiber-optic broadband infrastructure especially to rural, undeserved and hard-to-reach areas. Telcos should

collaborate with other financial institutions to develop cost-effective, yet sustainable products underwritten by government policy initiatives to cushion the costs.

Enterprise Investments Into SMEs

Social enterprises should be incentivized to create digital hubs that curate funding opportunities directed at developing relevant context-ready digital solutions to grow digitized SMEs. These innovative institutions will compete to offer toolkits that eventually elevate digitized tools for SMEs.

Expand Digital Training and Certification

There are many initiatives between the policies of NPP and NDC that promote digital innovation. These need to be examined, optimized, and adapted to meet the changing economic objectives of the country. To align these policies with the business community, private sector players, policy implementors, and stakeholders should develop context-aware training and certification programs that focus on the most vulnerable SME operators. This should boost the benefits that will accrue from digitized business activity.

Conclusion

Without a doubt, Ghana has made significant strides when it comes to investing in digital inclusivity and IT infrastructure. Multiple stakeholder engagements are required to harmonize all the strengths that come from pooled resources to expand digital training, investment, and relevant policy to create a self-sustaining paradigm for growth of the digital economy.

Digitalization represents a defining development area in the modern world, in which every country participates. Through digitalization, economies can operate more efficiently, information flows faster, technological advancements are promoted, and innovation is encouraged. However, the development of digitalization poses many challenges. There can be differences in access and usage between individuals and social groups, as well as between countries. It is in the interest of governments to promote digitalization within their own territories to reduce existing disparities through infrastructure, development, and training programs. These programs aim to develop digitalization in ways that provide both social and economic benefits. Government interventions focus on three main areas: building digital infrastructure, creating and supporting digital competence and skills development programs for users, and implementing measures aimed at economic development. In this context, we present how Hungary is working to bridge the digital divide.

The National Digitalization Strategy 2022–2030

In Hungary, economic developments have seen significant improvements for over a decade, with digital advancements also playing a key role. Over the past 10 years, almost full network coverage and Internet access have been established, household Internet usage has significantly increased, and the number of those rejecting digital technology has decreased. Hungary's goals and strategy are outlined in the **National Digitalization Strategy 2022–2030**, compiled by the Prime Minister's Cabinet Office. The program is based on four pillars: the development of digital infrastructure, the enhancement of digital competences, the digital economy pillar, and the digital state, which focuses on improving government services.⁹³

The development measures for **digital infrastructure** include key factors such as the expansion of Gigabit networks and the improvement of educational infrastructure, contributing to the enhancement of the digital level of education. The program also includes the development of national networks, the expansion of bandwidth, and the establishment of next-generation mobile networks. Additional measures focus on improving the wireless communication capabilities of emergency and defense organizations, as well as expanding supercomputing (HPC) capacities that serve research and public institutions, which can also support SMEs.

The development of the **competence pillar** includes the creation of educational programs aimed at enhancing digital competencies in public education, as well as training IT professionals to support the creation of a skilled workforce in the digital sector.

The **digitalization of economic development** focuses on improving digital technology both within and outside companies, with particular attention to underdeveloped areas. Economic digital developments also include the use of state-owned data assets under proper conditions for economic purposes.

The fourth pillar, the **digital state**, includes measures to digitally develop public administration, aiming for more efficient and user-friendly government services.

The strategy created by the government was preceded by **the Economic Development and Innovation Operational Program (GINOP)**, which held force between 2014 and 2020.⁹⁴ This program set out objectives that included the development of info-communications, which improved ICT infrastructure, promoted the digital economy, and enhanced broadband Internet access. To further support digital developments, the Digital Renewal Operational Program Plus (DINOP) will serve from 2021 to 2027.⁹⁵ This program, co-financed by the EU, seeks to advance digitalization in Hungary through four main priorities. It supports the digital transformation of businesses and the digital development of public services, facilitates the green transition through targeted IT investments, further develops broadband networks, and promotes the enhancement of digital competencies among citizens and the digital integration of educational systems.

Digital State and Rules for Providing Digital Services Act (DÁP)

A significant milestone in Hungarian electronic public administration is the **Digital State and Rules for Providing Digital Services Act (DÁP)**, established in 2023, which introduces the concept of digital citizenship. Within the framework of this program, the Digital Hungary Agency (DMÜ) has created a user-friendly mobile application that allows citizens to manage their official affairs online and digitally while adhering to the appropriate IT and cybersecurity policies.⁹⁶

Hungary has a comprehensive strategy and program in place regarding digitalization developments. Both the national state budget and significant EU funds are available to ensure the implementation of these programs and measures for digital transformation.

INDIA

The Information Technology and Innovation Foundation Leah Kann and Stephen Ezell

Promoting the digitalization of the Indian economy has been a priority of the Modi administration, as seen through efforts to spread broadband Internet access, the development of the Aadhaar system for public identification, and initiatives to attract semiconductor industry investment to the country.

India's Aadhaar System

Conceptualized in 2009, India's Aadhaar system provides Indian citizens with a 12-digit individual identification number, allowing for a safe and reliable way to give each of India's 1.4 billion residents a unique and secure identity. Prior to the development of this program, which is run through the Unique Identification Database Authority of India (UIDAI), around 400 million people in India did not have access to any individual identifying documents, preventing them from directly accessing government subsidy programs as well as other fundamental rights such as voting or education. The program, which operates under similar principals as America's social security number, was given an annual budget of around \$95 million in the fiscal year 2023-2024 and is continuing to expand its efforts to enroll the entire country in the program. As of this year, 1.38 billion Aadhaar numbers have been generated.

Aadhaar verifies an individual by relying on the biometric data of iris scans and all 10 fingerprints to link an individual to their Aadhaar number. This identification allows for people historically unable to partake in India's economy and social services to access financial services, such as bank accounts and SIM cards. Part of the ingenuity of the system was the initial cardless feature promised by Aadhaar, for once a number had been assigned to specific biometric data, it would be stored in the cloud and accessing services would be as easy as an eye or fingerprint scan.

The implementation of Aadhaar has been a huge success in terms of wide-spread implementation across India. In combination with the Aadhaar digital ID and the Unified Payments Interface (UPI), India has experienced a digital payments revolution, with \$3 trillion worth digital payments in 2022, which is expected to grow to \$10 trillion by 2026. India has now rebranded its digital stack as the "Digital Public Infrastructure" (or DPI) and has offered it for adoption at scale across developed and developing economies alike. India's DPI represents a transformative digital innovation, not just for India, but for countries around the world.

Increasing Broadband Internet Access

Internet penetration remains one of India's main barriers to increasing connectivity and access to information across the country. Today, just over half of the country has access to the Internet. However, between 2010 and 2020, the percent of Indian Internet users rose from 8 to 43 percent thanks to increasing national efforts to expand access in rural areas. A main push in this effort has been Prime Minister Modi's plan for 100 smart cities, which would build new technology hubs across the country that can help increase access to the Internet and facilitate deployment of more-advanced technologies such as traffic pattern monitoring, smart electrical grids, and Internet access in schools. These smart cities are expected to have widespread impact on surrounding areas, but it's important to note that their success should be measured not only by increased human connectivity through the Internet, but also equitable economic growth and improved governance. As of July 2024, about 90 percent of the smart city project had been implemented,

and the Modi administration stated that it expected the remaining 10 percent to be completed by March 2025.

Having been launched in 2015, the effects of the smart cities have already been felt in many cities across India. While 100 cities became the focus of the project, the number of projects implemented in each city has been the main metric of success, and cities such as Bhubaneswar and Indore have successfully implemented traffic management and waste management, making the cities far more technologically advanced.

Expanding India's Presence in Semiconductor Supply Chains

India is already a major player in global semiconductor supply chains, especially with regard to the design of semiconductors. The country employs approximately 20 percent of the world's semiconductor design engineers, or about 125,000 individuals.⁹⁷ About 3,000 individual integrated circuits (ICs) are designed in India each year.⁹⁸ In terms of very large-scale integration (VLSI)—which refers to the process of creating an IC by combining millions or billions of MOS (metal-oxide) transistors onto a single chip—India accounts for 15 percent of their global production.⁹⁹ Almost every one of the world's top-25 semiconductor design companies—including Intel, Texas Instruments, NVIDIA, and Qualcomm—have design and R&D centers in India.¹⁰⁰

But India now wants to become a more significant player in semiconductor manufacturing, both in the fabrication of chips and in their post-production assembly, test, and packaging (ATP). As such, in December 2022, India established the India Semiconductor Mission (ISM), a government organization to guide the promulgation of central government policy and incentive packages to attract semiconductor-sector investment across each key phase of semiconductor production: design, fabrication, and ATP (with additional incentives to attract display fabs).¹⁰¹ The heart of the effort is the Rs 76,000-crore (approximately \$10 billion) “Semicon India Programme,” which includes a variety of mechanisms designed to accelerate development of various facets of India's semiconductor ecosystem. The program's flagship fiscal incentive devotes \$10 billion to a match package, wherein the Indian central government offers to cover 50 percent of the project cost—with the relevant Indian state kicking another 20 to 25 percent—to companies establishing semiconductor foundries (at any node level) or ATP facilities.

The efforts have led to some notable successes. In June 2023, semiconductor memory chip manufacturer Micron announced it would launch a major ATP facility for dynamic random-access memory (DRAM) and NAND products in Sanand, Gujarat.¹⁰² In January 2024, India's government approved three new proposals to build semiconductor manufacturing plants in the country worth a combined 1.26 trillion rupees (\$15.2 billion).¹⁰³ Tata Group has plans to build two plants, one in partnership with Powerchip in Gujarat state's Dholera and a second solo effort in the eastern state of Assam. The joint effort will be worth 910 billion rupees (\$11 billion) and anticipates a plant built with the capacity to produce 50,000 12-inch wafers per month, while the standalone project will see the Tata Semiconductor Assembly and Test arm of Tata establish a chip packaging plant worth 270 billion rupees (\$3 billion). In the third initiative, CG Power, Renesas, and Stars Micro will collaborate on a joint venture to build a 76 billion rupees (\$92 million) chip packaging facility.¹⁰⁴ With these announcements, India is well on its way to becoming an ever-more significant player in the global semiconductor manufacturing industry.

Ireland is pursuing a number of initiatives to broaden digital access, implementation, and adoption, as the following case study highlights.

National Broadband Plan (NBP)

The NBP targets over 560,000 premises in areas where commercial operators have no plans to invest, encompassing more than 1.1 million people, over 65,000 farms, approximately 44,000 non-farm businesses, and 679 schools. The plan involves extensive infrastructure development, including laying 140,000 kilometers of fibre cable and utilizing over 1.5 million poles, covering 96 percent of Ireland's land mass. The aim is to provide minimum download speeds of 500 megabits per second (Mbps), significantly improving Internet service quality for users.

Analysts expect the National Broadband Plan to have far-reaching impacts. By boosting rural economies, it equips businesses with the tools to compete globally, to attract investment, and to create jobs in rural areas. It also enhances public services by facilitating improved e-health services, online education, and efficient government services accessible to all citizens. Moreover, the plan promotes social inclusion by ensuring equal opportunities for all individuals, regardless of location, to participate in the digital society.

To support connected communities, approximately 284 publicly accessible Broadband Connection Points (BCPs) are being established, providing early high-speed Internet access ahead of the main fibre rollout. The NBP is integral to government strategies across various sectors, including climate action, sustainable growth, and social inclusion.

Manna Aero Drone Delivery

Traditional delivery services often face challenges in efficiently reaching rural and suburban areas. In Ireland, Manna Aero, a drone delivery company founded by Bobby Healy, is revolutionizing last-mile logistics through advanced technology.¹⁰⁵ Manna's innovative approach addresses accessibility issues in areas traditionally underserved by conventional logistics.

Manna operates autonomous drones capable of delivering goods directly to consumers' homes within three minutes. These drones are equipped with sophisticated navigation systems and are licensed by the Irish Aviation Authority, ensuring safety and efficiency. Manna has commenced operations in several Irish towns, including Oranmore and Balbriggan, aiming to provide high-volume deliveries and partnering with local businesses.¹⁰⁶

During the COVID-19 pandemic, Manna's contactless delivery services supported social distancing measures and ensured essential goods were accessible to residents, showcasing the potential of drone technology in addressing logistical challenges.¹⁰⁷ The company's operations have been well-received, with high adoption rates in trial areas reflecting strong community engagement.

Manna Aero's success has also led to international expansion plans. The company has conducted trial operations in America and is exploring opportunities in other countries, demonstrating Ireland's leadership in drone technology.¹⁰⁸ By providing a new channel for businesses to reach

customers, Manna supports local enterprises, boosts sales, and contributes to Ireland's innovation ecosystem.

Brightbeam AI

AI is a transformative technology that can enhance productivity and efficiency across many sectors. Brightbeam AI, an Irish AI company founded in 2023 by Paul Savage, Brian Hanly, and Phil Black, exemplifies how AI solutions can support SMEs in their digital journey.¹⁰⁹ Brightbeam provides users of multiple systems with a single point of access and entry. It then uses “beneath the hood AI” to “paper over the cracks” of the poorly designed and difficult-to-navigate user interfaces in each core system. Brightbeam is working to deliver these digital tools throughout state services.

Core Objectives of Brightbeam AI

- **Democratizing AI for Businesses:** Assisting companies in leveraging AI by adapting it for their processes, focusing on automating tedious and time-consuming administrative tasks.
- **Enhancing Operational Efficiency:** Offering AI-powered tools that automate routine tasks such as call summaries, enabling employees to focus on strategic activities.
- **Supporting Business Growth:** Helping businesses make better use of AI to find ways to adapt it for use in their processes.

Brightbeam AI operates on a fully remote basis and has plans to double its staff by the end of 2024 as part of its U.S. entry strategy. The company has raised €450,000 (\$486,000) in funding and is supported by Enterprise Ireland, leveraging networks to access international markets and opportunities.

Impact on SMEs

- **Automating Administrative Tasks:** AI technology listens to calls, summarizes discussions, and identifies action items, reducing the administrative burden on staff and increasing productivity.
- **Cost Management:** Assisting businesses in finding better pricing options for utilities and services, contributing to financial efficiency.
- **Access to Opportunities:** Identifying business tenders and opportunities aligned with a company's services, which aids in growth and expansion.¹¹⁰

Brightbeam AI's mission is to be "the most helpful company in the world," permeating every aspect of its operations. By making AI accessible and practical for SMEs, Brightbeam AI empowers businesses to embrace digital transformation without significant upfront investments.

ITALY

*I-Com, Institute for Competitiveness
Competere*

*Stefano da Empoli
Pietro Paganini*

The Italian government has made promoting digitalization a national priority, as the following case study demonstrates.

Fondo per la Repubblica Digitale (The Digital Republic Fund)

The Digital Republic Fund (FRD), established in November 2021, is an innovative which seeks to support the country's digital transition. The Fund is structured as a public-private partnership to finance digital education and inclusion projects, with a total allocation of €350 million (\$378 million) for the period 2022–2026. Funded by contributions from banking foundations, the Fund offers a tax credit of 65 percent for 2022 and 2023 and 75 percent for the period 2024–2026. The objective is to improve Italy's Digital Economy and Society Index (DESI) indicators, developed by the European Commission, by selecting projects through targeted public calls. The governance structure revolves around the Strategic Steering Committee (CIS), which defines guidelines, evaluation criteria, and oversees the project selection process. The Independent Scientific Committee (CSI), supported by the Evaluation Lab, is responsible for assessing the impact of funded projects, using a counterfactual and qualitative approach to identify scalable best practices to propose as public policies. At the beginning of this year, the 2023 Activity Report was published, providing a comprehensive overview of the Fund's operations, strategic directions, and results during the reporting period, outlining the processes and criteria for project selection and funding to promote digitalization in Italy.¹¹¹ Specifically, it clarifies that the Fund's lines of intervention are focused on four strategic areas:

1. Upskilling and reskilling of NEETs (Not in Education, Employment or Training 15–34 years old individuals) to facilitate labor market entry;
2. Upskilling and reskilling of women and girls to increase female participation in the labor market and address gender asymmetries;
3. Upskilling and reskilling of residents on the margins of the labor market (unemployed and inactive individuals over 34 years old) to facilitate reintegration;
4. Upskilling of workers with jobs at risk of replacement due to automation and technological innovation.

The Fund's calls for proposals, designed to be pay-for-performance, aim to finance innovative and scalable projects that achieve clear objectives through key performance indicators (KPIs). The winners of these calls, if positively evaluated, gain a competitive advantage for future calls. In 2022, the "Futura" and "Onlife" calls were launched to support women (18–50 years old) and NEETs (15–34 years old), respectively. Both calls attracted strong participation: 320 proposals were submitted, of which 227 were eligible for merit evaluation. At the end of the evaluation process, 23 projects were funded, with a total of €12,794,848 (\$13.8 million) allocated and a total of 4,831 beneficiaries. The projects covered different geographical areas, including "National," "North and Center," and "South and Islands" projects, ensuring a fair distribution of resources. In 2023, the Fund introduced two new calls: "Prospettive" and "In

Progresso”, with a total budget of €30 million (\$32.4 million) and the goal of reaching approximately 9,000 beneficiaries. The “Prospettive” call aims to fund projects to improve the digital skills of unemployed and inactive people between the ages of 34 and 50, while the “In Progresso” call focuses on workers with high-risk jobs of replacement due to automation.

The Fund’s communication strategy has been actively implemented through its website and social media, engaging various stakeholders such as foundations, government institutions, and sector partners. Additionally, webinars and meetings have been organized to raise awareness and inform sector operators about the calls and funding opportunities. In 2023, a collaboration was launched with RAI, the Italian TV public broadcaster, for the “skillZ” program and with Will Media, a news company on Instagram, for a podcast dedicated to beneficiaries’ stories.

Neoconnessi (Newly connected)

Neoconnessi (newly connected) is a digital education initiative put forward by WINDTRE, one of the largest Italian telcos, aimed at raising awareness among children, parents, and teachers about the importance of safe and responsible Internet usage.¹¹² Targeting primarily Italian primary schools, the program provides educational tools to develop digital skills and promote a positive and responsible approach to online navigation, aligning with the National Plan for Digital Education and European educational policies. Neoconnessi focuses on three main objectives: educating primary school children, particularly younger ones, on how to navigate the web safely and responsibly; engaging parents and teachers by offering resources to support children’s digital learning and guiding them toward appropriate Internet use; promoting digital literacy as a fundamental skill; and enhancing awareness of the risks and opportunities associated with digital technologies.

The initiative encompasses various educational activities designed to engage the entire school community: educational kits for primary schools, including interactive lessons, practical exercises, and educational games to teach basic principles of online safety, privacy, and ethical behavior; events and workshops, both in-person and online, for students, teachers, and parents, fostering dialogue on digital security; and partnerships with educational institutions and non-governmental organizations to extend the project’s impact and disseminate best practices in digital citizenship.

Now in its sixth edition, the project has reached over 7,400 teachers, 7,500 schools, and 1 million students. In February 2023, in collaboration with the Italian Society of Pediatrics, the “Decalogue Neo-Connessi: 10 Steps for Informed and Protected Families Online” was introduced, providing guidelines for navigating children’s early digital experiences, along with brief guidelines and “cyber wisdom” tips for effective digital education. For younger audiences, the storybook “Nati Digital. Story for Curious Little Explorers” was created, while parents can benefit from the online course “Digital Families Today: Navigating Together Safely,” designed to offer clear rules and best practices for Internet use. Additionally, the “NeoConnessi Silver” initiative targets older individuals with video tutorials and articles on smartphone use and recent applications, aimed at enhancing their digital skills and ensuring safe and informed online activities.

Digital Leap: A Municipality’s Path to Better Services and Social Inclusion

Digitalizing public services in recent years has revolutionized the interaction between citizens and local administrations, enhancing accessibility and inclusion. In the municipality of Lanciano,

located in the Abruzzo region of central Italy, an online platform for managing public documents and administrative procedures has been implemented, making services more accessible to all citizens.

Problem: Before adopting this digital platform, citizens were required to visit municipal offices in person to carry out administrative tasks. This process was time-consuming and contributed to environmental pollution due to CO₂ emissions for travel. Moreover, the need to visit offices during business hours discouraged many citizens, particularly workers and the elderly, who found it difficult to visit during these times or lacked means of transportation, causing inconvenience for both the individuals and the municipal administration.

Adopted Solution: Since January 1, 2024, Lanciano has implemented an online submission platform that allows citizens to compile and submit requests at any time, removing the constraints imposed by office hours. This innovation has proven particularly significant for a medium-sized town in central Italy, greatly improving citizens' participation in public life.

Advantages: **Time savings:** Impact shows that 50 percent of requests are completed and approximately 50 percent of the requests are submitted outside of office hours, including 13 percent on days when the offices are closed. **Transparency:** The platform enables citizens to manage and monitor their administrative procedures in real time, enhancing the transparency of the process. **Reduction in CO₂ emissions:** By eliminating the need for travel to the offices, 8,930 km of travel has been saved, preventing the emission of approximately 1,071.6 kg of CO₂.

Conclusion

The digitalization project in Lanciano, funded by European resources within the National Recovery and Resilience Plan (PNRR) program has demonstrated how modern technologies can significantly enhance the efficiency of public services while contributing to environmental sustainability and social inclusion. Citizens now enjoy greater flexibility and accessibility, leading to the optimal management of their administrative needs. It is essential to continue developing and optimizing these services to ensure a future that is both more sustainable and inclusive.

Introduction

Korea ranks as the 20th-most globally competitive nation according to the 2024 International Institute for Management Development.¹¹³ This is Korea's highest position to date, largely due to the dominance of national conglomerates like Samsung and Hyundai. However, this success has overshadowed a significant challenge—the widening productivity gap between conglomerates and SMEs, which is already the largest among OECD countries.¹¹⁴

Given that SMEs represent 99.9 percent of all Korean businesses and provide 81 percent of employment in Korea's private sector, narrowing this productivity gap is crucial for sustainable economic growth of Korea.¹¹⁵ Here, narrowing the digital divide between SMEs and conglomerates can play a key role in narrowing this gap, as digitalization holds the potential to boost productivity growth and bolster their global competitiveness, according to Information Technology & Innovation Foundation (ITIF).¹¹⁶

Although Korea possesses one of the world's most advanced digital infrastructures, the digital adoption gap between conglomerates and SMEs remains prevalent. This paper will explore the Korean government's initiatives aimed at bridging this digital divide, with a focus on improving digital literacy, providing financial support for ICT infrastructure deployment, and enhancing the adoption of key digital technologies among SMEs.

Current Status of SME Digitalization in Korea

SMEs represent the lifeblood of the Korean economy. They make up nearly all firms and employ over 81 percent of the business-sector workforce—the second highest ratio in the OECD, following Greece.¹¹⁷ Yet, Korean SMEs face a severe productivity gap in comparison to large conglomerates. According to an OECD report from 2024, the productivity gap among SMEs and large firms remained the largest among OECD countries, with Korean SMEs' productivity standing at just 29 percent and 46.4 percent that of large firms, respectively, in the manufacturing and service sectors.¹¹⁸ Digitalization plays a crucial role in productivity enhancement. Yet, despite Korea's globally renowned digital infrastructure, SMEs have lagged in digital adoption. According to the Korea Institute for Industrial Economics & Trade (KIET), while approximately 24 percent of large companies have adopted digitalization in their business operations, under 10 percent of Korean SMEs have done so.¹¹⁹ The increased rate of digital adoption also shows a significant gap between the two groups according to KIET. While large corporates showed a 11.1 percent increase in number of businesses that adopted digital technology between 2017 and 2022, only 3.7 percent of SMEs have done so, implying a widening gap of digitalization between conglomerates and SMEs.¹²⁰ ITIF strongly suggested concentrated support policies for digitalization of Korean SMEs in 2018, but these figures highlight the continued need for enhanced policy efforts that encourage the adoption of digital technologies for SMEs.¹²¹

Key Factors Behind the Digital Divide

The digital divide between SMEs and conglomerates in Korea can be attributed to several factors:

Lack of Awareness of Digitalization's Benefits

Many SMEs remain unaware of how digital tools could boost productivity, reduce costs, or

increase global competitiveness. A study by the Korea Economic Institute of America found that one of the main reasons SMEs do not automate processes is because they do not feel competitive pressure to do so.¹²² This lack of urgency is further exacerbated in sectors where automation is not yet the norm. In addition, the fear among low-skilled workers of losing their jobs as a result of digitalization has also been an obstacle against the adoption of digitalization among SMEs.¹²³

Financial Barriers to Digitalization

SMEs often perceive the costs of adopting digital tools as prohibitively high. A survey by the Korea Productivity Center, commissioned by the Ministry of Trade, Industry, and Energy, found that 37.4 percent of SMEs cite high costs as the main barrier to digital transformation.¹²⁴ This lack of capital constrains their ability to make necessary investments in advanced technology, such as enterprise resource planning (ERP) systems, 5G, or AI applications.

Workforce Capacity and the Digital Skills Gap

Korea's workforce faces a considerable digital skills gap, particularly within the SME sector, with 54.9 percent expressing it as the top challenge according to KPC.¹²⁵ The workforce in SMEs tends to be older, with 88 percent of employees aged 50 and above concentrated in SMEs, according to Korea Statistics.¹²⁶ Many older workers lack the digital skills necessary to operate in an increasingly digitized environment. In comparison, large firms employ younger workers, with 50 percent of conglomerate employees under 40 years old, compared to only 33 percent in SMEs. This age disparity makes it harder for SMEs to transition into digitalized operations, further widening the gap between them and large firms.

Government Policies to Bridge the Digital Divide

Recognizing the urgent need to support SMEs, the Korean government has implemented several key initiatives aimed at reducing the digital divide, including the following:

Raising Awareness of Digital Transformation

The Ministry of Trade, Industry, and Energy and the Federation of Medium Enterprises have developed the *Digital Transformation CEO Academy*. This program specifically targets SME leaders, offering training that emphasizes the importance of digital transformation, leadership, and organizational change. Through this initiative, SME CEOs are introduced to strategies for integrating digital tools into their business models, helping to foster a top-down push for greater digital adoption.

The Korean government has taken steps to lower the barriers to digital adoption for SMEs by providing access to essential ICT tools and software. Recognizing that SMEs may be hesitant to invest in digital technologies due to uncertainty about the benefits and limited opportunities to trial them, the government has launched programs designed to address these challenges. One such initiative is the Digital Services Voucher Program, established by the Ministry of SMEs and Startups.

The Digital Services Voucher Program, launched in September 2020, allows SMEs to experiment with digital services at a low cost, thus reducing the financial risks. The program provides SMEs with up to KRW 4 million (almost \$3,000) to cover 70 to 90 percent of the cost of acquiring digital services, such as e-signature tools, cybersecurity software, videoconferencing solutions, and online training.¹²⁷ SMEs bear only 10 to 30 percent of the total cost. The initiative is designed to help SMEs test and adopt digital technologies tailored to their needs, especially during urgent situations like the COVID-19 pandemic.

Providing Financial Support for Digitalization

One of the key policies introduced by the government is the *Smart Manufacturing Diffusion and Advancement Strategy (2018)*, which focuses on turning traditional manufacturing facilities into smart factories. Smart factories incorporate technologies like ERP, AI, and robotics to modernize production processes, requiring purchases of new equipment and technical support—all of which imply significant financial barriers. To reduce such barriers, the government provides grants and subsidies to SMEs for equipment purchases and consulting services under this strategy. By decentralizing this support through regional industrial complexes and agencies such as the Korea Smart Factory Office (KOSMO), the program ensures that funding is accessible to SMEs across the country.

Originally seeking to convert 30,000 factories into smart factories by 2022, which amounts to half of all manufacturing SMEs in Korea, the government exceeded its goal by converting a total of 30,144 factories—enabling an average of 27.9 percent increase in productivity and 15.9 percent reduction of costs—according to KOSMO.¹²⁸

Improving Workforce Digital Skills

Addressing the workforce's digital skills gap represents a priority for Korea's government. The Ministry of Science and ICT launched the Digital Capacity Building Program in 2020, which provided training to 2.87 million citizens across more than 900 training centers nationwide in 2023.¹²⁹ Notably, 58.3 percent of the trainees are senior citizens, directly addressing the digital divide between generations.¹³⁰ This program ensures that older workers, who represent a large portion of the SME workforce, acquire the skills needed to operate in a digitalized economy.

Moving Forward: Korea's New Integrated Approach

In July 2022, the Korean government enacted the Industrial Digital Transformation Promotion Act, marking a significant step toward integrating all digitalization efforts into a comprehensive framework.¹³¹ The act lays out an all-encompassing digital transformation policy, with the Ministry of Science and ICT taking the lead. This act establishes Collaboration Support Centers throughout the country, which assist SMEs in overcoming digital adoption challenges by providing resources, training, and consultations.

Under the Act, the Ministry of Science and ICT has announced its *Implementation Plan for Industrial Digital Transformation (2023)*, which focuses on leveraging AI technologies for SME digitalization.¹³² Based on the lessons learned from its implementation of the Smart Manufacturing Diffusion and Advancement Strategy, which focused on the quantitative reach, the new Plan aims to focus more on the quality of the digitalization support, committing to invest KRW 400 billion (\$288.8 million) by the end of 2024.¹³³

Conclusion

By addressing these key factors, Korea is working to reduce the digital divide between SMEs and conglomerates, ensuring that its smaller businesses can also harness the full potential of digital transformation. This will not only enhance the productivity and global competitiveness of SMEs but also ensure that Korea continues to thrive in the global digital economy.

Kyungjin Song would like to express her thanks to LEE Jaemyung and KIM Jeongyeon for their support in writing this case study.

The Philippines has implemented a number of initiatives to expand access to digital infrastructure and promote digital adoption and inclusion.

National Broadband Program

The government's National Broadband Program, which aims to improve Internet connectivity in the Philippines, has five components: National fiber backbone, Luzon Bypass Infrastructure, Accelerated Tower Build, Accelerated Fiber Build, and Satellite Overlay. The first component, the National Fiber Backbone (NFB) Phase 1, was launched in April 2024. It includes a 1,245-kilometer cable network that establishes 28 nodes and provides 600 gigabits per second (Gbps) of optical spectrum capacity, linking 14 provinces in the northern Philippines. The project aims to provide Internet access to government institutions and public areas, particularly underserved communities, to enhance access to education, healthcare, and economic opportunities. The remaining phases are expected to be completed by 2026, aiming to reach 33 to 65 percent of the country's 70 million people out of a total population of 115 million while reducing Internet costs to as low as \$5 per Mbps.¹³⁴

The Luzon Bypass Infrastructure project (2nd Component) is an international connectivity gateway linked to cable landing stations and offers the government an Internet capacity of 2 terabits per second (Tbps). It represents a joint effort of the Department of Information and Communications Technology (DICT), Meta (formerly Facebook), and the Bases Conversion and Development Authority (BCDA). Component 3, the Accelerated Tower Build, aims to enhance middle-and last-mile network connectivity by constructing telecommunications towers in geographically isolated areas and designated missionary zones across the country. The first tower under this initiative was completed in Boac, Marinduque, in April 2023, with the capacity to connect at least 42 government facilities. The Accelerated Fiber Build (4th component) extends the DICT's fiber optic network to connect approximately 1,033 government agencies. Finally, Component 5 involves deploying a satellite overlay to provide immediate broadband Internet access in remote locations where building fiber network infrastructure is difficult or impractical.¹³⁵



Free Wi-Fi Program

The Free Internet Access in Public Places Act (Republic Act No. 10929), enacted in 2017, aims to provide free Internet service across various public places nationwide. This includes government offices, public educational institutions, healthcare centers, public parks, libraries, and transport terminals, with a minimum speed requirement of 2 Mbps. The initiative is funded by the Free Public Internet Access Fund (FPIAF), sourced from spectrum user fees collected by the National Telecommunications Commission (NTC) from Internet service providers and other funding sources. The Department of Information and Communications Technology monitors and oversees the program. As of January 2024, 12,421 live sites provide free Internet access nationwide.¹³⁶

DICT's TECH4ED-DTC Program

The Department of Information and Communications Technology's ICT Literacy and Competency Development Bureau created the Tech4ED program in 2015 to provide ICT equipment and digital literacy to communities. It evolved into a self-sustaining hub called Digital Transformation Centers (DTCs), created in collaboration with the International Telecommunication Union (ITU). It offers ICT-enabled services and digital skills training, including basic and intermediate digital literacy, capacity building for policymakers, and training for micro, small, and medium enterprises (MSMEs). These centers will provide physical facilities for training, co-working, events, and virtual platforms with online courses, learning modules, and e-government services. The upgraded DTCs emphasize digital literacy training and development. The ITU contributes by providing resources for capacity building and training, such as CISCO NetAcad, HP Life learning management systems, and other digital tools. Additionally, DICT partners with various organizations to offer content and platforms, including Tekno-Aklatan (National Library of the Philippines), MSME resources (DTI Negosyo Centers), DOST-Starbooks, UP-LEAP, and the DA Agricultural Training Institute. As of

2022, there were 1,891 partner-managed Tech4ED centers, excluding school-based ones. By September 2023, 23 out of the targeted 36 DTCs were already functioning. The General Appropriations Act requests annual funding for the Tech4ED-DTC project.¹³⁷

Connected Women

Connected Women has made significant efforts to promote greater digital inclusion and economic empowerment for women by providing education, training, and job opportunities.¹³⁸

- **WeEmpowerAsia Program:** In partnership with the European Union and UN Women, Connected Women launched the WeEmpowerAsia program to address digital inclusion for Filipino women. This program provides training on transitioning businesses online, improving IT skills, and leveraging online work opportunities.
- **Artificial Intelligence and Data Annotation (AIDA) Training:** Through its collaboration with UN Women, Connected Women has trained over 250 participants in AI and data annotation. This training provides women with in-demand digital skills crucial in the tech industry. In May 2021, Connected Women and TESDA extended this effort by offering 1,000 women free AIDA training and internet allowances.
- **Women Empowerment-ICT (WE-ICT) Initiative:** Connected Women partnered with DICT and Facebook on the Women Empowerment-ICT (WE-ICT) initiative. This program focuses on digital skills development and job matching to enhance digital literacy among women and provide them with economic opportunities.
- **WeTrainWeMatch Program:** The WeTrainWeMatch program, a joint effort with the DICT, matches women trained in digital marketing with female entrepreneurs. This initiative equips women with relevant digital skills and connects them with job opportunities, fostering inclusion in the digital and entrepreneurial spheres.

POLAND: DIGITAL INCLUSIVITY AND ICT INFRASTRUCTURE PROGRESS IN POLAND

THINKTANK Center for Dialogue and Analysis Adrianna Śniadowska/Małgorzata Bonikowska

Poland is leading the way in digital transformation in Central and Eastern Europe with a comprehensive strategy focused on enhancing digital inclusivity, deploying advanced ICT infrastructure, and supporting the digital transformation of SMEs. These efforts are crucial components of Poland's broader digital strategy, which aims to drive economic growth, bridge the digital divide, and create a more inclusive society. By addressing the digital needs of various sectors, including the elderly, rural populations, SMEs, and educational institutions, Poland is laying the foundation for a future where all citizens can fully participate in the digital economy. This holistic approach is essential for harnessing the full potential of the digital revolution, fostering innovation, improving public services, and enhancing the quality of life for everyone.

Enhancing Digital Inclusivity

Poland has launched several initiatives aimed at improving digital inclusivity, with a focus on vulnerable groups such as the elderly, individuals with disabilities, and residents of rural areas. Digital inclusivity is critical to ensuring that all citizens can benefit from digital advancements, regardless of their socio-economic status, geographic location, or age.

Digital Poland Programme (Program Operacyjny Polska Cyfrowa – POPC)¹³⁹

The **Digital Poland Programme** is a flagship initiative, funded by the European Union, aimed at reducing the digital divide across the country. It focuses on enhancing Internet access, improving digital literacy, and promoting the use of digital services, particularly in rural areas that traditionally have been underserved by private sector investments. A key goal of the program is to ensure that these areas gain the same access to high-speed Internet as urban regions. Additionally, the program supports the development of e-government services, enabling citizens to interact with public administration through digital platforms.

Active+ Program (Program Aktywni+)¹⁴⁰

The **Active+ Program** is a critical component of the broader Digital Poland strategy, targeting the elderly population to enhance their digital literacy. This program offers tailored training sessions to help seniors acquire essential digital skills, such as using the Internet safely, navigating e-services, and staying connected with loved ones through digital platforms. By empowering seniors with digital skills, the Active+ Program plays a crucial role in fostering social inclusion and reducing the digital divide among Poland's aging population.

Public Internet for everyone (Publiczny Internet dla Każdego)¹⁴¹

Recognizing the importance of Internet access for all citizens, the **Public Internet for Everyone** initiative focuses on expanding high-speed Internet access, particularly in underserved areas. This program has been designed to ensure that no region in Poland is left behind in the digital age, facilitating access to digital services, education, and economic opportunities through robust internet connectivity.

Accessibility Plus (Program Dostępność Plus)¹⁴²

Another significant initiative is **Accessibility Plus**, which aims to improve the accessibility of public services and spaces for individuals with disabilities. This program includes efforts to enhance

digital accessibility, ensuring that government websites, e-services, and digital platforms are usable by all citizens, regardless of their physical abilities. The program also promotes the development of digital tools that cater to the specific needs of individuals with disabilities, ensuring they have equal opportunities to participate in the digital economy.

Digital Competence Development Programme (Program Rozwoju Kompetencji Cyfrowych)¹⁴³

The **Digital Competence Development Programme** aims to enhance the digital skills of Polish citizens across all age groups. This initiative includes a range of educational programs and workshops designed to improve digital literacy, from basic Internet skills to more advanced competencies such as coding and cybersecurity. The program is particularly focused on reaching groups that are at risk of digital exclusion, including the elderly, rural populations, and those with limited access to digital education.

Deployment of ICT Infrastructure

Poland has made substantial investments in ICT infrastructure, recognizing its foundational role in supporting digital transformation. These efforts aim at ensuring that the necessary technological backbone is in place to support the digitalization of public services, businesses, and educational institutions.

National Education Network (Ogólnopolska Sieć Edukacyjna – OSE)¹⁴⁴

The **National Education Network (OSE)** represents an ambitious project aimed at modernizing the Polish education system by providing all schools with high-speed Internet access. This initiative is critical for ensuring that students across Poland, regardless of their location, enjoy access to the digital tools and resources necessary for a modern education. The OSE also includes cybersecurity measures to protect students and educational institutions from digital threats, reflecting the importance of safe online environments for learning.

E-Government Development (Rozwój E-Administracji)¹⁴⁵

Poland is placing a strong emphasis on the development of **e-government services** as part of its broader digital transformation strategy. This initiative includes the digitalization of public administration processes, making it easier for citizens to interact with government agencies online. Key components of this program include the introduction of digital IDs, online tax filing systems, and e-health services, all designed to streamline government-citizen interactions and improve public service efficiency.

National Cybersecurity Strategy (Krajowa Strategia Cyberbezpieczeństwa)¹⁴⁶

As Poland expands its digital infrastructure, cybersecurity has become a top priority. The **National Cybersecurity Strategy** outlines the government's approach to protecting its digital assets and citizens from cyber threats. This strategy includes the development of a robust legal and regulatory framework, the establishment of cybersecurity standards, and the promotion of public-private partnerships to enhance the country's cybersecurity posture.

Supporting SMEs in Digital Transformation

SMEs constitute the backbone of the Polish economy (99.8 percent of Polish companies), and their successful digital transformation is crucial for the country's economic growth.¹⁴⁷ Poland has implemented several programs to support SMEs in adopting digital tools and technologies.

Smart Growth Operational Programme (Program Operacyjny Inteligentny Rozwój – POIR)¹⁴⁸

The **Smart Growth Operational Programme (POIR)** is a comprehensive initiative that provides financial support and guidance to SMEs looking to implement digital technologies. This program offers a variety of grants, loans, and other financial instruments to help businesses invest in digital solutions such as cloud computing, AI, and cybersecurity tools. By supporting SMEs in their digital transformation, the POIR helps to enhance their productivity and competitiveness in both domestic and international markets.

Innovation Voucher (Bon na Innowacje)¹⁴⁹

A specific component of the Smart Growth Operational Programme is the **Innovation Voucher**. This initiative allows SMEs to collaborate with research institutions and universities to develop innovative digital products and services. The Innovation Voucher helps bridge the gap between research and industry, facilitating the commercialization of new technologies and fostering innovation in the SME sector.

Industry 4.0 (Przemysł 4.0)¹⁵⁰

The **Industry 4.0 initiative**, managed by the Polish Agency for Enterprise Development (PARP), was designed to help SMEs adopt advanced manufacturing technologies. This program focuses on supporting the implementation of automation, AI, and the Internet of Things (IoT) in manufacturing processes. By adopting these technologies, SMEs can significantly improve their productivity, reduce costs, and compete more effectively in global markets.

National Centre for Research and Development (Narodowe Centrum Badań i Rozwoju, NCBR)¹⁵¹

The NCBR represents a key institution in supporting research and innovation in Poland, offering various funding programs and grants to promote R&D activities in SMEs. It plays a significant role in fostering Industry 4.0 by supporting projects that focus on new technologies and industrial innovations.

Cybersecurity for SMEs (Firma bezpieczna cyfrowo)¹⁵²

The **Cybersecurity for SMEs** program is an initiative by the Polish government aimed at enhancing cybersecurity in SMEs. This program provides comprehensive support for SMEs to secure their digital operations against cyber threats. It includes practical tools, educational resources, and expert consultations to help businesses assess their current cybersecurity level and implement necessary improvements. The initiative focuses on raising awareness about digital security risks and promoting the adoption of best practices in cybersecurity management. This effort is particularly crucial in the current digital age, where SMEs increasingly face sophisticated cyber-attacks that could threaten their operations and growth.

SAN FRANCISCO BAY AREA/CALIFORNIA, UNITED STATES

Bay Area Council Economic Institute

Sean Randolph

The state of California is working to accelerate the adoption of AI through public-private partnerships to support a digitally educated workforce.

The accelerated application of AI is a priority for many businesses but also for state and local governments. This is particularly the case in the San Francisco/Silicon Valley Bay Area, which has become the global epicenter for the industry. Consider that:

- 25 of the top generative AI companies in the world are located in the Bay Area;
- More than half of the most highly capitalized generative AI companies in the world are Bay Area-headquartered;
- 54 percent of global AI funding has gone to Bay Area companies;
- The region has more than four times the number of AI job postings as the next 13 metro areas in the United States;
- Beyond well-known generative AI companies such as Open AI and Anthropic, which are acquiring hundreds of thousands of square feet of office space in the San Francisco area, more than 80 emerging generative AI companies, most of them venture-funded, are also opening expanded offices.



Executive Order for AI Implementation By California's State Government

As this suggests, how the sector develops is highly consequential for the region and the state, and there is strong agreement among policy leaders as well as businesses that AI will be critical to both California's economic competitiveness and its long-term growth. There is also wide agreement that broad societal access to AI tools will be essential. Essentially, the use of AI should be democratized to enable entrepreneurial and small business growth and to support the creation of new jobs where older jobs may be replaced. One way this will happen is through training and the development of workforce skills. Reflecting this, in 2023 California's governor issued an executive order laying out a strategy for AI implementation by the state government. The approach is iterative, recognizing that the capabilities of generative AI technology are new, will develop rapidly, and have implications that are not yet fully understood. It also contains several key elements that are forward-leaning and aim to support the accelerated use of AI to improve the quality and efficiency of state services. The risks of generative AI are clearly recognized, and each state agency will be expected to develop procedures—with the governor's support—to manage risks that apply to their own fields of responsibility. State employees will be given training in how to use AI, including training on its appropriate use.

Under this plan multiple proof-of-concept pilot programs are currently being developed with industry leaders to test different applications.

Pilot Partnership With Nvidia to Advance California's AI Capabilities

The first pilot to be announced (to occur in 2024) is with the Bay Area chip-making company Nvidia, with the goal to expand AI tools and resources to help workers, educators, and students learn new AI skills. The effort particularly focuses on California's large community college system, which awards two-year degrees and technical certificates, often to lower-income students and workers. Together, California and Nvidia aim through the partnership to train 100,000 students, college faculty, developers, and data scientists.

Nvidia will:

- Provide technical guidance, mentorship, and access to advanced AI hardware and software resources;
- Create learning paths for AI talent and industry-recognized certifications in specific sectors, including train-the-trainer programs for faculty; and
- Explore the creation of hackathons and design sprints that showcase practical applications.

California will:

- Fund worker training initiatives across educational institutions and industries and work with Nvidia to create faculty programs to improve AI literacy and curricula;
- Support initiatives to use AI technologies to address local challenges, including providing opportunities for students to work on real-world AI projects;
- Explore support for early-stage startups and for public-private partnerships aimed at creating AI innovation zones and job-creation hubs; and

- Implement AI skills training for state careers, including roles for AI specialists in government.

Together California and Nvidia will:

- Collaborate to create AI laboratories in higher education facilities to support ongoing research;
- Work AI concepts into the curricula of community colleges so students can learn new applications and find jobs;
- In cooperation with employers, organize AI bootcamps that are relevant to in-demand local jobs, to build an AI workforce; and
- Expand AI certificate programs to meet local employer's needs.

The experience provided by this pilot will inform future training programs in California and anticipate the many unresolved questions surrounding AI and its impact on employment.

While the answers to those questions are still unclear, the strategy adopted by California views AI adoption and the skills that support it as a competitive asset that should be broadly distributed, and recognizes that partnerships with private industry to develop that skill base will be an essential tool.

SOUTH AFRICA: SOUTH AFRICA'S DIGITAL OPPORTUNITY

Centre for Risk Analysis

Chris Hattingh

With a new Government of National Unity (GNU) formed following South Africa's latest national and provincial elections in May 2024—and the former sole majority party, the African National Congress receiving 40 percent in 2024—different ideas, policies, and ways of thinking about the existing legislative and economic landscape in the country have emerged. For the last few years terms such as “fourth industrial revolution” have dominated policy discussions around the digital and communications sectors; now the work done in these areas before the elections can be built upon.

The South African National Broadband Plan

Around 70 percent of the South Africa population has access to the Internet; however, the quality and cost of this access varies widely. As of 2024, the government aims to increase this percentage to 80 percent. The South African National Broadband Plan seeks to ensure all citizens have access to high-speed Internet connectivity by 2030. The Plan largely hinges on promoting competition in the telecoms sector, thereby encouraging private investment (and spurring competition for government departments and companies, leaning on them to improve their quality of service and drive down prices).

On competition, there has been progress in this respect over the last two years, with Google's first Cloud data center being deployed on the African continent, enabled by a \$1 billion Google investment initiated in 2022, which started operating in Johannesburg in January 2024.

While not an explicit policy as such, the government aims to bridge the “digital divide” in deploying ICT infrastructure by encouraging and opening space for the private sector to invest in said infrastructure.

One of the more successful PPPs in the ICT infrastructure space has been the Telkom Connected Schools Program (CSP); Telkom is a state-owned company, in which the government and various government investment bodies combined own a 54.1 percent stake. The CSP, launched in 1998, has been made possible by both public and private capital and other investments. Over the years the CSP has made possible Internet access to more than 800 schools across South Africa.

The South African Connect Initiative

A second policy, the South African Connect Initiative, seeks to provide affordable and reliable broadband connectivity to all schools, hospitals and government offices in the country by 2025. Coupled with the South African National Broadband Plan mentioned above, the Initiative's focus is on improving the service offering provided by, and capabilities of, government entities and departments. As any South African citizen will be more than willing to tell you, most experiences with entities such as Home Affairs, airports, etc., are less than optimal most of the time.

As is the case with the National Broadband Plan, the success of the Initiative hinges on encouraging private sector investment and capital formation. The South African government faces serious fiscal challenges; while the National Treasury has performed a commendable job over the last two years to stabilize the debt-to-GDP ratio at around the 75 percent level, debt repayments and a tight fiscal balancing act are likely to remain the status quo for the foreseeable future. Therefore, the easiest path to build new ICT infrastructure is to ensure the regulatory and legislative frameworks are as conducive as possible to private sector investment.

Ongoing Challenges to Digital Deployment

A major barrier to entry regarding Internet access is that of affordability; with economic growth rates low (an average of 0.8 percent since 2012), consumers regularly have less disposable income available. In South Africa 1 gigabyte (GB) of data consumes over 2 percent of many citizens' average monthly income, thus falling below the United Nations Broadband Commission's affordability threshold.

Investments in ICT infrastructure and broadband Internet access in South Africa have the potential to spur greater Internet access in the broader sub-Saharan African region as well; in Mozambique, 23 percent of the population have consistent access to and use the Internet; in Zimbabwe, 32.6 percent; in Madagascar, 20 percent; in Namibia, 62 percent; and in Botswana, 77 percent. Only 11 countries on the African continent have 5G capable infrastructure in place.

Absent the necessary legislative and policy work to spur investments into ICT infrastructure in South Africa—and to thereby bridge the digital divide—the government risks undermining the potential of the Africa Continental Free Trade Area. As the Trade Law Centre summarizes: “The wheels of international trade are powered by the Internet. From the smallest informal trade to a major supply agreement, contracts are transacted online, whether via email, e-commerce store, or digital platform. Any formal trade relies on the internet for implementation—financing, documentation and logistics are all digitally driven and becoming more and more so. Whether it is an emailed order, an online purchase, or merely the financial arrangements behind the transaction, the internet will inevitably be used in conducting international trade.”¹⁵³

As to the risks ahead, political analyst Ralph Mathekga captures the major impediment as follows: “A lack of political will to drive the initiative of full integration of African communities into the digital world remains a challenge many governments in the region now face. Currently the status quo is an unfavorable and vague policy environment whereby many policymakers pay lip service to digital connectivity, but little more. Some officials still do not see that connectivity is a necessity that cannot be ignored without bearing adverse consequences on living conditions and economic development.”¹⁵⁴

South African policy reforms have often run into the problem of a “lack of political will.” The government policies explained above could very possibly run into the same problem. A crucial differentiating factor, though, is the country's new government, in which there is significant competition between ministries. Already, in departments such as Home Affairs, there has been substantial progress, so much so that representatives of the former sole majority party have

expressed their concerns and frustrations about being “shown” up by their cabinet colleagues. It is within this context of new winds, new ideas, and competition, that the ICT space and related investments can benefit.

The country’s population has also grown steadily more urbanized; while there remain key differences between urban and rural populations, and different challenges, more people moving to bigger metros can make it easier to provide Internet access to yet more people. The country’s digital divide, and efforts to narrow it, comes to the following three aspects: access to hardware, understanding digital means of communication, and Internet affordability. The two key policies unpacked here, namely the South African National Broadband Plan and the South African Connect Initiative, will be measured by their success or failure in addressing these three key factors.

With an official unemployment rate above 33 percent, and a 45 percent unemployment rate for the 15-34 age group—all in the context of a growing population—South Africa is well placed to take advantage of advances in the ICT infrastructure space. So too, should the government and private sector not move quickly to address some of the major barriers to digital access, citizens’ frustrations with the status quo are guaranteed to increase in intensity.

UKRAINE: 3 MUST-HAVE ASSETS IN THE UKRAINIAN RESILIENCE AND POST-WAR RECOVERY

We Are Innovation

Tetiana Rak

At the risk of a full-scale war, Ukraine declares and actively promotes digital transformation at both the sovereign and state levels. What is the situation like today and what fields require the improvements?

The Rise of Digital Public Services

Digital government services save time, streamline processes, and offer a lifeline, especially during a full-scale war. With many Ukrainians displaced, either internally or abroad, the efficiency of state authorities is often dictated by the country's national security situation.

Statistics show a growing interest in e-government services among Ukrainians. But did everyone have a smooth experience? Were the algorithms and processes intuitive enough for users to navigate independently?

While digitalization offers clear benefits, it also risks excluding parts of the population—people without access to technology or those lacking digital literacy. Among people with disabilities, only 49 percent use digital services. For older citizens, that number drops to 33.5 percent. Equal access to digital services is an area that needs attention. This includes online applications for benefits, participation in government processes, and remote communication with authorities.

In 2020, Ukraine's Ministry of Digital Transformation launched the Diia app, which has revolutionized the country's digital landscape. “Diia” stands for “state and me” and represents Ukraine's vision of efficient citizen-government interactions. The app has become a crucial tool for Ukrainians, especially those in Russian-occupied territories, where it often serves as the only connection to government support.

Today, almost 22 million Ukrainians use the Diia portal, and over 19.2 million have installed the app on their smartphones. It's been a game-changer, especially in areas where traditional services have been disrupted. Diia has not only improved access to government services but has also cut through the red tape, reducing opportunities for corruption.

The success of platforms like Diia shows that Ukraine's path forward is rooted in the continued modernization and inclusivity of its public digital services. These services should be accessible to everyone, regardless of their social, economic, or physical conditions.

True digital inclusivity means ensuring that all population groups can participate in decision-making, provide feedback, and interact with government bodies. This inclusiveness reduces corruption and fosters a fair, democratic, and efficient state administration that meets the needs of all citizens.

Collaboration With the Tech Sector

For this vision to succeed, Ukraine's government must create a business environment that encourages investment in the digital tech sector. Specifically, the focus should be on fostering companies that promote digital education and employment opportunities for people with disabilities. Incentives, like tax benefits for companies that invest in digital skills programs for disabled veterans or civilians, could push this forward.

But it's not just the government's responsibility. Other stakeholders, including businesses and NGOs, must contribute to the broader effort of digital inclusion. As Ukraine looks toward its future and long-term recovery, ensuring no one is left behind in the digital space is critical.

Ukraine's journey toward digitalization began in 2018 with the adoption of the “Concept for the Development of the Digital Economy and Society.” This roadmap laid the foundation for advancing digital infrastructure, promoting digital skills, and integrating technology into sectors such as healthcare, education, and public safety. The Concept for the Development of the Digital Economy and Society featured several ambitious goals, including:

- Stimulating economic growth and attracting investment;
- Transforming domestic industries to become more competitive through digitalization;
- Closing the digital divide by bringing technology to citizens in rural areas;
- Creating opportunities for innovation, creativity, and digital entrepreneurship; and
- Boosting exports of digital products and services, especially in IT outsourcing.

During this period, Ukraine rolled out 4G services and strengthened cybersecurity through new laws, including protections for electronic signatures. These measures fueled IT sector growth, with the industry contributing \$1.5 billion to Ukraine's economy in 2018—accounting for 16.7 percent of the country's total service export volume.

Looking ahead, the prospects for Ukraine's digital tech sector are promising, especially if the government continues to prioritize inclusivity and innovation. By creating a more favorable business environment through targeted incentives, Ukraine can attract both local and international investments in tech-driven companies. This will not only create new jobs but also open opportunities for marginalized communities, such as disabled veterans and civilians, to enter the digital workforce.

Digital Education

In May 2023, an updated and upgraded version of the Diia.Education digital platform was designed to close the digital divide in Ukraine by offering free, engaging content to help individuals develop the skills needed to thrive in an increasingly digital world. The platform quickly gained popularity, attracting 1.5 million users in its first year. However, Russia's full-scale invasion in early 2022 forced a shift in focus, as millions of Ukrainians faced unprecedented social upheaval.

The invasion has caused the largest refugee crisis in Europe since World War II, displacing millions. Homes and jobs have been lost, and nearly 60 percent of internally displaced Ukrainians are of working age, according to the United Nations. For many, finding work in unfamiliar regions is a daunting task. One solution lies in reskilling and acquiring the digital competencies that modern employers seek.

Though the war has disrupted Ukraine's job market, it has also accelerated the global trend toward digitalization. Diia.Digital now addresses this reality, offering career-oriented tests alongside national digital literacy assessments. Users can choose from over 50 job-specific educational series, ranging from social media management to baking. The platform also offers courses on digital literacy, entrepreneurship, and creativity. A key addition is the job search function, allowing users to connect with employment opportunities as they upskill.

Despite the devastation of the Russian invasion, Ukrainians have shown remarkable resilience, determined to rebuild their lives. The challenge now is to equip displaced individuals with the tools they need to re-enter the workforce and contribute to the nation's recovery. This means balancing the needs of the wartime job market with the broader global shift toward digital skills that will be in demand in the decades ahead.

Ukraine's commitment to digital inclusivity is crucial to its recovery. As the country upgrades its digital infrastructure and embraces technology, it must ensure that everyone can access and benefit from these advances. Platforms like Diia show how digital tools can simplify government services, cut through bureaucracy, and promote transparency. But to fully close the digital divide, Ukraine must prioritize its most vulnerable groups—citizens with disabilities, the elderly, and those displaced by the war.

Collaboration is key. The government, tech sector, and civil society must work together to create opportunities for everyone, especially for those who need digital skills to rebuild their lives. By investing in education and job initiatives, Ukraine can help its citizens succeed in a modern economy.

As Ukraine rebuilds, digital inclusivity must be at the center of its efforts. Innovation alone isn't enough—everyone must have access. By focusing on inclusivity, Ukraine can recover stronger and more united, with a digital future that empowers all its citizens.

UNITED STATES

Information Technology and Innovation Foundation

Gillian Diebold and Jessica Dine

Digital.gov

Digitalizing government, through means such as digitizing paper forms or modernizing websites to make them more accessible, can greatly improve how Americans interact with the federal government and how the government provides services. While government services and information have traditionally been delivered through analog or in-person activities, digital government brings these services to the public through digital technologies such as apps, websites, and data repositories.

Digital government transformation and modernization is a critical project for the United States and requires resources to improve the digital capabilities of government agencies and workers. With the deployment of the Digital.gov site, the General Services Administration (GSA) has taken on the key task of equipping government agencies and employees with the tools, methods, guidance, and community needed to improve their digital efforts. This resource is a fundamental step in improving digital inclusion at the federal level. Although it is not inherently consumer-facing, Digital.gov plays an important behind-the-scenes role in ensuring that Americans can receive government services at any time, on any device. By bolstering digital government, Digital.gov supports agencies in expanding their digital capabilities and thus helps them better and more equitably achieve their respective missions.

Digital.gov has six guiding principles, including promoting digital literacy, bringing a human focus to digitalization, and enabling collaboration and transparency.¹⁵⁵ The site's resources translate certain complex digital government efforts into plain language and provide assistance developing digital literacy targeted to government employees of all ages and backgrounds. Moreover, by employing a human-centered approach to technology, the site supports agencies in promoting digital inclusion and considering the accessibility of their services.

Some of the featured resources available on the site include:

- Guidance on the 21st Century Integrated Digital Experience Act (IDEA), which mandates that digital government services are easy-to-use, mobile-friendly, data-driven, and accessible.¹⁵⁶
- An “introduction to accessibility” guide, which explains accessibility in law, video explainers about accessibility literacy, and best practices for accessibility in design and technology.¹⁵⁷
- Seven different communities of practice in which agency employees can collaborate and share resources across government, including various workshops and summits in areas like plain language writing, web management, and social media.¹⁵⁸

Connect 313

Underlying efforts toward digital inclusion in the United States is the need to increase digital connectivity, or the ability for individuals to access the Internet. The remaining subset of the population without Internet access is on the wrong side of the “digital divide,” and because of that they suffer a number of harms. Public and private institutions can offer online services that are often more accessible, affordable, and available than in-person versions. But without widespread connectivity, some individuals cannot access those services, putting them at

a social and economic disadvantage.¹⁵⁹ Moreover, the digital divide leads to economic loss for society as a whole because high connectivity rates support valuable institutions like the digital economy. The COVID-19 pandemic, which caused sudden increased reliance on digital resources and exposed social inequities, underscored the urgency of closing the digital divide and prompted local governments to take real action.

The Connect 313 program in the city of Detroit, Michigan, illustrates the potency of digital inclusion and provides a blueprint for other locales nationwide to enhance their digital inclusion efforts. A self-described “citywide, data-driven digital inclusion strategy,” the holistic program aims to harmonize a variety of disparate, digital-focused organizations under a singular framework.¹⁶⁰ By 2024, Connect 313 aims to have all Detroiters connected to the Internet through appropriate devices, connections, and with the support and digital resources necessary for improved well-being in all facets of their lives. Beginning with the onset of the pandemic, Connect 313 facilitated private investments in digital inclusion and made Internet connections available for offline students in the city. Notably, it also established “tech hubs” to serve as community hubs for digital literacy, IT support, and tech guidance. A core part of its efficacy was its commitment to acquiring accurate connectivity data to ensure targeted, effective investments in underserved areas. Thanks to its array of diverse stakeholders, the city of Detroit went from one of the least connected large cities in the United States as of 2019 to having a 67.5 percent digital inclusion rate among residents in 2022.

By not only providing connectivity but also addressing the need for devices and technical support, Connect 313 epitomizes a multifaceted approach to digital inclusion with a sustainable trajectory. The lessons from this project can extend far beyond this one city. Its interconnected model includes private sector commitments, municipal governance, and social services, and underscores the importance of collaboration in digital inclusion efforts.

ISPs Partnering with Community Hubs

Digital involvement requires access to the Internet, the ability to afford a subscription and device, the know-how to use online resources and the time and freedom to take advantage of these skills. Offline groups often face barriers from multiple fronts, so a “networked” model—a term referring to collaborative efforts from a diverse array of institutions including Internet Service Providers (ISPs), public libraries, nonprofits, advocacy and social service organizations, schools, etc.—is a highly effective driver of inclusion because it reflects the complexity of the digital inclusion landscape.¹⁶¹

As the major players in the U.S. communications sector, private ISPs in particular play a significant role in digital inclusion and digital literacy efforts, given that they have massive resources and data on where people are connected and where they are not. To take advantage of institutions with preexisting community roots and earned trust, ISPs often partner with existing nonprofits or other institutions like public libraries and community recreational centers to offer free Internet access, digital literacy training, or help applying to low-cost broadband programs. Absent a strong top-down system of digital inclusion, partnerships between large private ISPs and community institutions harness the advantages of both to effectively channel resources toward individual pockets of the community.

For example, the U.S. cable company Comcast created “Lift Zones,” a program that puts free Wi-Fi in various community centers, as part of its digital inclusion initiative. Comcast set an initial goal of 1,000 Lift Zone locations in 2020 and has opened over 1,250 to date.¹⁶² The program is meant to complement low-cost home Internet access by providing a space for low-income students and others to learn or work remotely during the day. In addition, beneficiaries have access to hundreds of hours of digital educational content or online digital literacy programs, on topics ranging from Internet basics and online safety to computer programming, through Comcast’s Internet Essentials.¹⁶³

Putting the Lift Zones and similar programs in existing community hubs ensures the most relevant audiences benefit from the free Internet and digital skills training. For example, Washington, D.C. nonprofits DC Dream Center (which provides tutoring and legal assistance) and Sasha Bruce Youthwork (which offers educational and career opportunities) are both Lift Zone locations.¹⁶⁴ Both have unique, community-oriented missions that are strengthened and enabled by their ability to provide free Internet and educational online content to their constituents. Moreover, because their preexisting customer bases are often disproportionately offline, institutions like these are instrumental in getting free Internet and digital skills content to those who need it most.

AT&T, another major U.S. telecommunications company, has similarly partnered with the Public Library Association (PLA) to offer a number of free online digital literacy courses to constituents in need through a program called AT&T ScreenReady.¹⁶⁵ One recent online course detailed the steps necessary to subscribe to the major low-income broadband subsidy program the Affordable Connectivity Program; others offer classic digital literacy training aimed at various audiences (“Digital Literacy for Kids”; “Digital Citizenship for Families”) and covering different topics (“Technology Basics”; “Online Safety”). These are only a few strong examples of partnerships between private ISPs and community institutions, an effective relationship that harnesses the best parts of each actor to maximize the benefits to consumers.

CONCLUSION

ICTs have become indispensable enablers of nations' economic growth and critical to unlocking economic and employment opportunity for all members of society. It's imperative that nations develop concerted strategies to deploy digital infrastructure, to help SMEs adopt digital technologies, and to educate citizens with the digital skill necessary to utilize and leverage digital technologies. This report from the Global Trade and Innovation Policy Alliance has provided a useful survey of several GTIPA member countries' efforts to advance the digitalization of their economies and societies.

Acknowledgments

The authors would like to thank the GTIPA contributors to this report: Prof. Syed Munir Khasru, Chairman, IPAG Asia Pacific; Rubayat E. Shams Anik, Senior Research Associate, IPAG and Fatema Tuj Johora Konka, Executive (Projects & Communication), IPAG; Peter Copeland, Deputy Director of Domestic Policy at the Macdonald-Laurier Institute; Barbara Engels, Senior Economist, and Jan Büchel, Economist for Data Economy, German Economic Institute; Franklin Cudjoe, Founding President & CEO, IMANI Africa; Csiko Balint Palfai, research intern, and Viktor Lazar, Professional Secretary to the President of Hungary's National Research Development and Innovation Office (NRDIO) on behalf of the Centre for Next Technological Futures at the Mathias Corvinus Collegium; Luke Fehily, Director of Innovation Policy at Progress Ireland; Pietro Paganini, President of Competere; Stefano da Empoli, President of I-Com; Kyungjin Song, Country Representative Korea, The Asia Foundation; Queen Oren, Researcher at Philippine Institute for Development Studies; Adrianna Śniadowska, CEO, ThinkTANK and Małgorzata Bonikowska, President, ThinkTANK; Sean Randolph, Senior Director, Bay Area Council Economic Institute; Chris Hattingh, Executive Director, Centre for Risk Analysis; Tetiana Rak, Chief Operations Officer, We Are Innovation; and Gillian Diebold and Jessica Dine, formerly policy analysts at the Information Technology and Innovation Foundation. We would also like to thank Erica Schaffer and Leah Kann of ITIF for supplemental assistance in producing this report.

About the Authors

Stephen Ezell is Vice President for Global Innovation Policy at the Information Technology and Innovation Foundation (ITIF) and Director of ITIF's Center for Life Sciences Innovation. He also leads the Global Trade and Innovation Policy Alliance. His areas of expertise include science and technology policy, international competitiveness, trade, and manufacturing.

Victor Vernick is currently a Policy Fellow for ITIF where he handles all research and matters relevant to the Global Trade and Innovation Policy Alliance. Vernick is currently a senior at American University studying Political Science and Government.

ENDNOTES

1. Oxford Economics, “Digital disruption: The growth multiplier,” January 20, 2016, <https://www.oxfordeconomics.com/resource/digital-disruption/>.
2. James Manyika et al., “Digital Globalization: The New Era of Global Flows,” (McKinsey Global Institute, February 2016), <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/digital-globalization-the-new-era-of-global-flows>.
3. Robert D. Atkinson, “Competitiveness, Innovation and Productivity: Clearing Up the Confusion” (ITIF, August 2013), <http://www2.itif.org/2013-competitiveness-innovation-productivity-clearing-up-confusion.pdf>.
4. Robert D. Atkinson and Ben Miller, “A Policymaker’s Guide to Spurring ICT Adoption” (ITIF, June 2015), http://www2.itif.org/2015-policymaker-ict-adoption.pdf?_ga=1.239879427.1806060799.1471894729.
5. James Manyika et al., “How to Compete and Grow: A Sector Guide to Policy” (McKinsey Global Institute, March 2010), <http://www.mckinsey.com/industries/public-sector/our-insights/how-to-compete-and-grow>.
6. Oxford Economics, “Capturing the ICT Dividend: Using Technology to Drive Productivity and Growth in the EU” (Oxford Economics, September 2011), <http://danielelepido.blog.ilsole24ore.com/files/oxford-economics.pdf>.
7. Robert D. Atkinson and Andrew S. McKay, *Digital Prosperity: Understanding the Economic Benefits of the Information Technology Revolution* (ITIF, March 2007), 3, http://www.itif.org/files/digital_prosperity.pdf.
8. Elsadig Musa Ahmed and Rahim Ridzuan, “The Impact of ICT on East Asian Economic Growth: Panel Estimation Approach,” *Journal of the Knowledge Economy*, No. 4 (December 2013): 540–55, <http://link.springer.com/article/10.1007%2Fs13132-012-0096-5>.
9. Stephen J. Ezell and Robert D. Atkinson, *The Good, the Bad, and the Ugly (and the Self-Destructive) of Innovation Policy: A Policymaker’s Guide to Crafting Effective Innovation Policy* (ITIF, October 2010), <https://itif.org/publications/2010/10/07/good-bad-and-ugly-innovation-policy>.
10. Stephen Ezell, “The Benefits of ITA Expansion for Developing Countries” (Information Technology and Innovation Foundation, December 2012), 5, <https://itif.org/publications/2012/12/16/benefits-ita-expansion-developing-countries>.
11. The World Bank, Poverty Reduction and Economic Management Unit Africa Region, “Kenya Economic Update” (The World Bank, December 2010), http://siteresources.worldbank.org/KENYAEXTN/Resources/KEU-Dec_2010_with_cover_e-version.pdf.
12. Ibid.
13. Almas Heshmati and Wanshan Yang, “Contribution of ICT to the Chinese Economic Growth” (working paper, RATIO Institute and Techno-Economics and Policy Program, College of Engineering, Seoul National University, February 2006), https://docs.google.com/file/d/1oFltzryXSMXs2UYqYRRRBDONuD4077q9CyeTB6tYhOT-C93xfDWnHfd1YbZH/edit?hl=en_US.
14. Ahmed and Ridzuan, “The Impact of ICT on East Asian Economic Growth.”
15. Richard Heeks, “ICT and Economic Growth: Evidence From Kenya,” *ICTs for Development*, June 26, 2011, <http://ict4dblog.wordpress.com/2011/06/26/ict-and-economic-growth-evidence-from-kenya/>.
16. Maryam Farhadi, Rahmah Ismail, and Masood Fooladi, “Information and Communication Technology Use and Economic Growth,” *PLoS ONE* 7, no. 11 (November 2012): 4–5,

<http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0048903&representation=PDF>.

17. Ibid.
18. The International Bank for Reconstruction and Development (IBRD) and The World Bank, “2009 Information and Communications for Development: Extending Reach and Increasing Impact” (IBRD and the World Bank, July 21, 2009), <https://openknowledge.worldbank.org/handle/10986/2636>.
19. Nina Czernich et al., “Broadband Infrastructure and Economic Growth,” *In CESifo Working Paper Series*, Vol. 2861 (2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1516232.
20. Deloitte, GSMA, and Cisco, “What Is the Impact of Mobile Telephony on Economic Growth?” (GSM Association, November 2012), <http://www.gsma.com/publicpolicy/wp-content/uploads/2012/11/gsma-deloitte-impact-mobile-telephony-economic-growth.pdf>.
21. IBRD and The World Bank, “2009 Information and Communications for Development.”
22. Elena Toader et al., “Impact of Information and Communication Technology Infrastructure on Economic Growth: An Empirical Assessment for the EU Countries,” *Sustainability*, Vol. 10, 3750 (2018), <https://www.mdpi.com/2071-1050/10/10/3750/pdf>.
23. Ebrahim Hosseini Nasab and Majid Aghaei, “The effect of ICT on economic growth: Further evidence,” *International Bulletin of Business Administration*, Vol. 5 (2009): 46–56, https://www.researchgate.net/publication/237227348_The_Effect_of_ICT_on_Economic_Growth_Further_Evidence.
24. Bala Veeramacheni, E.M. Ekanayake, and Richard Vogel, “Information Technology and Economic Growth: A Causal Analysis,” *Southwestern Economic Review*, Vol. 34 (2011): 75–88, <http://swer.wtamu.edu/sites/default/files/Data/75-88-55-202-1-PB.pdf>.
25. Andrey Zagorchev, Geraldo Vasconcellos, and Youngsoo Bae, “Financial development, technology, growth and performance: Evidence from the accession to the EU,” *Journal of International Financial Markets, Institutions and Money*, Vol. 21 (2011): 743–759, https://www.researchgate.net/publication/251636823_Financial_development_technology_growth_and_performance_Evidence_from_the_accession_to_the_EU.
26. Toader et al., “Impact of Information and Communication Technology Infrastructure on Economic Growth,” 16.
27. Thomas Niebel, “ICT and Economic Growth—Comparing Developing, Emerging and Developed Countries” (discussion paper no. 14-117, Centre for European Economic Research (ZEW), December 15, 2014), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2560771.
28. Khuong Vu, “Measuring the Impact of ICT Investments on Economic Growth,” *Journal of Economic Growth* (2005), <https://www.hks.harvard.edu/m-rcbg/ptep/khuongvu/Key%20paper.pdf>.
29. Ayoub Yousefi, “The Impact of Information and Communication Technology on Economic Growth: Evidence from Developed and Developing Countries,” *Economics of Innovation and New Technology*, Vol. 20 (2011): 581–596, <https://www.tandfonline.com/doi/abs/10.1080/10438599.2010.544470>.
30. Niebel, “ICT and Economic Growth.”
31. Ibid.
32. Muhammad Tariq Majeed and Tayba Ayub, “Information and communication technology (ICT) and economic growth nexus: A comparative global analysis,” *Pakistan Journal of Commerce and Social Sciences*, Vol. 12, Issue 2 (2018): 443–476.
33. M. Cardona, T. Kretschmer, and T. Strobel, “ICT and Productivity: Conclusions From the Empirical Literature,” *Information Economics and Policy* 25 (2013): 109–125.
34. European Parliamentary Research Service, *ICT in the Developing World* (Brussels, Belgium: European Commission, December 2015),

- [http://www.europarl.europa.eu/RegData/etudes/STUD/2015/563482/EPRS_STU\(2015\)563482_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2015/563482/EPRS_STU(2015)563482_EN.pdf); The World Bank, *Information and Communications for Development 2009: Extending Reach and Increasing Impact* (The World Bank, May 2009), <http://elibrary.worldbank.org/doi/abs/10.1596/978-0-8213-7605-8>.
35. T.D. Stanley, Chris Doucouliagos, and Piers Steel, “Does ICT Generate Economic Growth? A Meta-Regression Analysis” (working paper, Deakin University, Australia, 2015), https://ideas.repec.org/p/dkn/econwp/eco_2015_9.html.
 36. Cardona, Kretschmer and Strobel, “ICT and Productivity.”
 37. Canada Radio-television and Telecommunications Commission, Broadband Fund: About the Fund (CRTC, Modified: December 2023), <https://crtc.gc.ca/eng/internet/fnds.htm>.
 38. Julian Thomas et al., “Measuring Australia’s Digital Divide: Australian Digital Inclusion Index: 2023,” (Melbourne: ARC Centre of Excellence for Automated Decision-Making and Society, RMIT University, Swinburne University of Technology, and Telstra), https://www.digitalinclusionindex.org.au/wp-content/uploads/2023/07/ADII-2023-Summary_FINAL-Remediated.pdf.
 39. Amber Marshall, “A New Rural Digital Divide? Taking Stock of Geographical Digital Inclusion in Australia,” *Media International Australia* 190(1) (2023), 68–84. <https://doi.org/10.1177/1329878X231202274>.
 40. Ibid.
 41. Julian Thomas et al., “Measuring Australia’s Digital Divide: Australian Digital Inclusion Index: 2023.”
 42. Marshall, “A New Rural Digital Divide? Taking Stock of Geographical Digital Inclusion in Australia.”
 43. United Nations Children's Fund (UNICEF), “90 per cent of adolescent girls and young women in low-income countries are offline – UNICEF,” April 27, 2023, <https://www.unicef.org/rosa/press-releases/90-cent-adolescent-girls-and-young-women-low-income-countries-are-offline-unicef>.
 44. United Nations Development Program (UNDP), “UNDP Bangladesh: Gender Equality Strategy 2023-2026,” (UNDP, 2023), <https://www.undp.org/sites/g/files/zskgke326/files/2023-03/GES%202023-2026%20Final%20Draft.pdf>.
 45. Korvi Rakshand, “Digital learning as a catalyst for educational equity and economic growth in Bangladesh,” *The Daily Star*, February 18, 2024, <https://www.thedailystar.net/anniversary-supplement-2024/innovate-educate-elevate/news/digital-learning-catalyst-educational-equity-and-economic-growth-bangladesh-3545096>.
 46. National Digital Literacy Mission, “About NDLM,” <https://nielit.gov.in/ajmer/content/national-digital-literacy-mission>.
 47. GSMA, “Accelerating Digital Literacy: Empowering women to use the mobile internet” (GSMA, 2015), https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2015/06/DigitalLiteracy_v6_WEB_Singles.pdf.
 48. Ibid.
 49. The Foreign Investors’ Chamber of Commerce and Industry (FICCI), “bKash: Powering Progress Through Mobile Financial Services,” September 29, 2024, <https://ficci.org.bd/en/blog/bkash-powering-progress-through-mobile-financial-services>.
 50. Azizur Rahman and Alvy Riasat Malik, “Electronic governance in Bangladesh: challenges and prospects,” *International Journal of Natural and Social Sciences* Vol. 77, Issue 4 (2020): 56–65 <https://ijnss.org/wp-content/uploads/2020/12/IJNSS-V7I4-8-pp-56-65.pdf>.
 51. A. Nguyen, “Digital Inclusion,” In: Liamputtong, P. (eds) *Handbook of Social Inclusion*. Springer, Cham (2021), https://link.springer.com/referenceworkentry/10.1007/978-3-030-48277-0_14-1.

52. Government of Canada, “On the horizon: Several perspectives on Canada’s technology future- 2030-35,” (Canada: National Research Council, April 2021), <https://nrc.canada.ca/en/corporate/planning-reporting/horizon-several-perspectives-canadas-technology-future-2030-35>.
53. Government of Canada, “Sustainable Canadian Agricultural Partnership” (Canada: Agriculture and Agri-Food, 2023), <https://agriculture.canada.ca/en/departement/initiatives/sustainable-canadian-agricultural-partnership>.
54. Government of Canada, “Governments driving innovation in food production” (Canada: Agriculture and Agri-Food, November 20, 2023), <https://www.canada.ca/en/agriculture-agri-food/news/2023/11/governments-driving-innovation-in-food-production.html>.
55. Macdonald Laurier Institute, “Canadian Innovation beats EU precaution in agriculture sustainability: Stuart Smyth for Inside Policy,” (MLI, September 2023), <https://macdonaldlaurier.ca/canadian-innovation-beats-eu-precaution-in-agriculture-sustainability-stuart-smyth-for-inside-policy/>.
56. Canadian Association of Professionals in Regulatory Affairs, “Artificial Intelligence- Revolutionizing the Healthcare Industry,” (CAPRA, October 2023), <https://capra.ca/en/blog/artificial-intelligence-revolutionizing-the-healthcare-industry-2023-10-27>.
57. Macdonald Laurier Institute, “Want cheap cellphone bills? Allow more foreign investment in telecoms: Aaron Wudrick in the National Post,” (MLI, January 2023), <https://macdonaldlaurier.ca/want-cheaper-cellphone-bills-allow-more-foreign-investment-in-telecoms-aaron-wudrick-in-the-national-post/>.
58. Canada Radio-television and Telecommunications Commission, Broadband Fund: About the Fund (CRTC, Modified: December 2023), <https://crtc.gc.ca/eng/internet/fnds.htm>.
59. Macdonald Laurier Institute, “No reason for Canada to rush AI policy,” (MLI, June 2024), <https://macdonaldlaurier.ca/no-reason-for-canada-to-rush-ai-policy/>.
60. Government of Canada, Digital Services Tax (Canada: Taxes, Modified: October 2024), <https://www.canada.ca/en/services/taxes/excise-taxes-duties-and-levies/digital-services-tax.html>.
61. Macdonald Laurier Institute, “A new Digital Services Tax would harm consumers and antagonize trade partners: David Collins for Inside Policy,” (MLI, September 2023), <https://macdonaldlaurier.ca/a-new-digital-services-tax-would-harm-consumers-and-antagonize-trade-partners-david-collins-for-inside-policy/>.
62. Government of Canada, “Online Streaming Act” (Canada: Broadcasting, Modified: November 2023), <https://www.canada.ca/en/canadian-heritage/services/modernization-broadcasting-act.html>.
63. Government of Canada, “National Cyber Security Action Plan (2019-2024),” (Canada: Public Safety, 2018), <https://www.publicsafety.gc.ca/cnt/rsracs/pblctns/ntnl-cbr-scrt-strtg-2019/index-en.aspx>.
64. Macdonald Laurier Institute, “Who will ‘plug and play’ with AUKUS?: Stephen Nagy in the Japan Times,” (MLI, May 2024), <https://macdonaldlaurier.ca/who-will-plug-and-play-with-aukus-stephen-nagy-in-the-japan-times/>.
65. Government of Canada, “Government of Canada improves access to affordable and effective drugs for rare diseases,” (Health Canada, March 2023), <https://www.canada.ca/en/health-canada/news/2023/03/government-of-canada-improves-access-to-affordable-and-effective-drugs-for-rare-diseases.html>.
66. Macdonald Laurier Institute, “Waiting for new drugs for rare disorders in Canada, part 8- need for a national strategy: Nigel Rawson and John Adams for Inside Policy,” (MLI, August 2023), <https://macdonaldlaurier.ca/waiting-for-new-drugs-for-rare-disorders-in-canada-part-8-need-for-a-national-strategy-nigel-rawson-and-john-adams-for-inside-policy/>.

67. Government of Canada, “Canada’s Indo-Pacific Strategy – Progress,” (Canada: International Relations, November 2022), https://www.international.gc.ca/world-monde/international_relations-relations_internationales/indo-pacific-pacifique/progress-progres.aspx?lang=eng.
68. Government of Canada, “EDC’s solutions facilitated \$131.4 billion in trade-related activities for more than 27,000 Canadian businesses,” (Canada: Export Development, May 2024), <https://www.edc.ca/en/about-us/newsroom/edc-iar-2023.html>.
69. Jan Büchel and Barbara Engels, “Development and Measurement of the Digitalisation of the Economy in Germany,” (Cologne: Federal Ministry for Economic Affairs and Climate Action, 2022).
70. Ibid.
71. Ibid.
72. Federal Ministry for Economic Affairs and Climate Action (BMWK), “What is Mittelstand-Digital?” (Cologne: BMWK, May 2023), <https://www.bmwk.de/Navigation/EN/Home/home.html>.
73. BMWK, “The centers in the Mittelstand-Digital network support on site,” (Cologne: BMWK, May 2023), <https://www.mittelstand-digital.de/MD/Redaktion/DE/Artikel/Mittelstand-4-0/mittelstand-40-kompetenzzentren.html>.
74. European Commission, “Digital Economy and Society Index (DESI),” (Germany; Brussels, 2022), <https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022>.
75. Von Natalie Beisch and Wolfgang Koch, “ARD/ZDF-Onlinestudie: Vier von fünf Personen in Deutschland nutzen täglich das Internet,” (Germany, October 2022), https://www.ard-zdf-onlinestudie.de/files/2022/2210_Beisch_Koch.pdf.
76. Lebenshilfen, “Herausforderungen bei der Nutzung digitaler Medien für Menschen mit Behinderungen,” (Graz, October 2020), <https://www.lebensgross.at/wp-content/uploads/2023/04/forschungsbericht-langversion.pdf>.
77. Ibid.
78. PIKSL, (Germany, 2023), <https://piksl.net>.
79. PIKSL, “Locations,” (Germany, 2023), <https://piksl.net/standorte/>.
80. PIKSL, “Services,” (Germany, 2023), <https://piksl.net/bildungsangebote>.
81. Barbara Engels et al., “Der Digitalisierung fehlen die Frauen,” (IW-Kurzbericht, March 8, 2023), <https://www.iwkoeln.de/studien/barbara-engels-alexander-burstedde-axel-pluenecke-der-digitalisierung-fehlen-die-frauen.html>.
82. Yvonne Lott, “The Gender Digital Gap in Transformation?” (Hans Böckler Foundation: Economic and Social Sciences Institute), February 28, 2023, <https://www.boeckler.de/de/pressemitteilungen-2675-berufstatige-frauen-bei-digitalisierung-im-nachteil-47258.htm>.
83. Sven Blumberg et al., “Women in tech: The best bet to solve Europe’s talent shortage, McKinsey, June 13, 2023, <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/women-in-tech-the-best-bet-to-solve-europe-talent-shortage>.
84. #SheTransformsIT website, <https://www.shetransformsit.org>.
85. Natalia Olhovik, “About Me,” <https://natalia-olhovik.com/about/>.
86. ITgirls website, <https://www.itgirls.de>.
87. United Nations (UN), “Roundtable on Digital Inclusion,” (UN, 2021), https://www.un.org/techenvoy/sites/www.un.org.techenvoy/files/general/Definition_Digital-Inclusion.pdf.
88. World Intellectual Property Organization (WIPO), “Global Innovation Index 2022,” (WIPO: GII, 2022), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_2000_2022/gh.pdf.

89. National Democratic Congress (NDC), “Resetting Ghana, 2024 Manifesto | Abridged Version,” (Ghana: NDC, 2024), https://johnmahama.org/files/shares/2024%20Manifesto_Abridged.pdf.
90. Isaaq Mohammed, “NPP outlines vision to build world-class digital economy,” *Ghana News Agency*, August 19, 2024, <https://gna.org.gh/2024/08/npp-outlines-vision-to-build-world-class-digital-economy/>.
91. Ghana Enterprise Agency (GEA), “GEA/Mastercard Foundation Bizbox Project,” (Ghana: GEA, 2023), <https://gea.gov.gh/tag/nbssi/>.
92. Malik Sullemana, “NDC to establish \$50m fintech growth fund to support digital economy - Ex-President Mahama,” *Ghanian Times*, February 26, 2024, <https://ghanaiantimes.com.gh/ndc-to-establish-50m-fintech-growth-fund-to-support-digital-economy-ex-president-mahama/>.
93. Hungarian Prime Minister's Cabinet Office, “National Digitalization Strategy 2022-2030,” (Budapest: August 2022), <https://cdn.kormany.hu/uploads/document/6/60/602/60242669c9f12756a2b104f8295b866a8bb8f684.pdf>.
94. Hungarian Ministry of National Economy, “Economic Development and Innovation Operational Program (GINOP) 2014-2020,” (Budapest: GINOP, 2015), https://www.pestmegye.hu/images/2015/Teruletfejlesztési_dokumentumok/Operatív_programok/Gazdaságfejlesztési_és_Innovációs_Operatív_Program-4.pdf.
95. Széchenyi Terv Plusz, “Digital Renewal Operational Program Plus 2021-2027.”
96. Hungarian Digital Agency, “National Digital Citizenship Program,” (Budapest: Digitális Magyarország Ügynökség, December 2022), https://www.dmu.gov.hu/documents/prod/DMU_nemzeti_digitalis_allampolgarsag_program_2022.pdf.
97. Nidhi Singal, “Is India a ‘semiconductor design’ nation? All you need to know,” *Business Today*, September 6, 2022, <https://www.businesstoday.in/technology/story/is-india-a-semiconductor-design-nation-all-you-need-to-know-346508-2022-09-06>.
98. India Electronic and Semiconductors Association (IESA), “Semiconductor Manufacturing Value Chain: India's Opportunity in the Global Market” (IESA, April 2022).
99. Narasimha Raju, “India Emerges as a Leader with Strong Presence of Major Semiconductor Companies – VLSI Expert Venkata Simhadri,” *CXOtoday*, January 6, 2023, <https://www.cxotoday.com/interviews/india-emerges-as-a-leader-with-strong-presence-of-major-semiconductor-companies-vlsi-expert-venkata-simhadri/>.
100. Ibid.
101. India Press Information Bureau, “India Semiconductor Mission,” December 21, 2022, <https://pib.gov.in/PressReleasePage.aspx?PRID=1885367>.
102. Micron, “Micron Announces New Semiconductor Assembly and Test Facility in India,” June 22, 2023, <https://investors.micron.com/news-releases/news-release-details/micron-announces-new-semiconductor-assembly-and-test-facility>.
103. Charlotte Trueman, “NXP Semiconductors to invest more than \$1 billion to boost its R&D in India,” *Data Centre Dynamics*, September 12, 2024, <https://www.datacenterdynamics.com/en/news/nxp-semiconductors-to-invest-more-than-1-billion-to-boost-its-rd-in-india/>.
104. Charlotte Trueman, “Indian government approves three chip fabs worth \$15.2bn,” *Data Centre Dynamics*, March 1, 2024, <https://www.datacenterdynamics.com/en/news/indian-government-approves-three-chip-fabs-worth-152bn/>.
105. Daniel Thomas, “Coffee by drone? Start-up Manna raises funds to deliver in UK,” *Financial Times*, April 28, 2021, <https://www.ft.com/content/cea2c993-b166-48f2-89a6-2caa914af785>.
106. Ibid.

107. Irish Aviation Authority (IAA), “Manna Aero gets operator certificate from IAA,” *RTE*, May 21, 2021, <https://www.rte.ie/news/business/2021/0521/1222994-irish-aviation-authority-and-manna/>.
108. Stephen Shankland, “Drone Deliveries Are Coming to a New Texas Suburb With Manna Expansion”, *CNET*, March 16, 2023, <https://www.cnet.com/tech/computing/drone-deliveries-are-coming-to-a-new-texas-suburb-with-manna-expansion/>.
109. Emmet Ryan, “Irish AI firm Brightbeam aims for US entry by end of this year,” *Business Post*, July 26, 2024, <https://www.businesspost.ie/news/irish-ai-firm-brightbeam-aims-for-us-entry-by-end-of-this-year/>.
110. Brightbeam Company Literature.
111. The Digital Republic Fund (DRF), “Report Attivita,” (Italy: DRF, 2023), https://assets.innovazione.gov.it/1708511314-report-frd_2023.pdf.
112. Neoconessi website.
113. International Institute for Magnet Development (IMD), “IMD World Competitiveness Booklet,” (IMD, 2024), 50.
114. Organization for Economic Cooperation and Development (OECD), “Why adult learning is important for Korean SMEs?” (Paris: OECD, 2020), 26.
115. Ministry of SMEs and Startups (MSS), “Significance of SMEs in Korea: Statistics Page,” (South Korea: MSS, 2024), <https://www.mss.go.kr/site/smba/foffice/ex/statDB/MainSubStat.do>.
116. Stephen Ezell et al., “Manufacturing Digitalization: Extent of Adoption and Recommendations for Increasing Penetration in Korea and the U.S.” (ITIF, 2018), 1, <https://www2.itif.org/2018-korean-manufacturing-digitalization.pdf>.
117. OECD, “Why adult learning is important for Korean SMEs?” (Paris: OECD, 2020), 26.
118. OECD, “Compendium of Productivity Indicators 2024,” (Paris: OECD, 2024), 51.
119. Korea Productivity Center (KPC), “Statistics on Labor Productivity by Sector and Firm Size,” (South Korea: KPC, June 2024).
120. Korea Institute for Industrial Economics & Trade (KIET), “Current Status of Digitalization in Korea and Policy Moving Forward,” (KIET, 2024), 19.
121. Ibid., 20.
122. Ezell et al., “Manufacturing Digitalization: Extent of Adoption and Recommendations for Increasing Penetration in Korea and the U.S.,” 52.
123. M. Pak, C. Andre, and J. Beomn, “Digitalization in Korea: A Path to better Shared Prosperity?” (Korea Economic Institute of America, 2021), 7.
124. Ministry of Science and IT (MSIT), “Renewing Formula for Industrial Innovation Success through AI,” news release, (South Korea: MSIT, January 2023).
125. Yoon Hee-Seok, “Press Release: Lack of Professional Human Resources –the Biggest Barrier Against Digitalization,” *Electronic Times*, October 25, 2023, <https://m.etnews.com/20231025000279>.
126. Korea Statistical Information Service Statistics (KOSTAT), “Job Administration Statistics Result,” KOSTAT, 2024), <https://kosis.kr/eng/>.
127. Digital Service Voucher Platform, <http://www.k-voucher.kr>.
128. Song Yoon-Seop, “Press Release: Digital Manufacturing Conference – the Age of 30,000 Smart Factories through Digital Transformation and Data Applications,” *Electronic Times*, May 24, 2023, <https://www.etnews.com/20230523000255>.
129. MSIT, “Press Release: Best Practices for Digital Capacity Building Program 2023,” *Electronic Times*, January 25, 2024,

<https://www.korea.kr/briefing/pressReleaseView.do?newsId=156612362&pWise=mSub&pWiseSub=C8#pressRelease>.

130. Ibid.

131. Korea Law Information Center, Industrial Digital Transformation Promotion Act (South Korea: Ministry of Government Legislation, Last revision: December 2021), <https://www.law.go.kr/LSW/eng/engLsSc.do?menuId=2§ion=lawNm&query=digital&x=0&y=0#liBgcolor7>.

132. Ibid, 12.

133. Ibid.

134. Department of Information and Communications Technology, “Secretary Uy lead charge for faster, more reliable internet in PH with National Fiber Backbone Phase 1 Project Grand Launch,” (PBMM, 2024), <https://dict.gov.ph/pbbm-secretary-uy-lead-charge-for-faster-more-reliable-internet-in-ph-with-national-fiber-backbone-phase-1-project-grand-launch/>.

135. Serafica and Oren, “Making Broadband Universal: A Review of Philippine Policies and Strategies” (Quezon: Philippine Institute for Development Studies, 2023).

136. Free Public Wi-Fi, “Free Wi-Fi for All Hotspots: List of Live Sites as of January 05, 2024,” <https://freepublicwifi.gov.ph/livehotspots/>.

137. Ibid.

138. Serafica and Oren, “Exploring Policies and Initiatives for Online Workers in the Philippines.” *In Critical Issues in the Philippine Digital Economy*, edited by C.G. Bayudan-Dacuycuy and R.B. Serafica. PIDS Book 2023-03. Quezon City, Philippines: Philippine Institute for Development Studies.

139. <https://www.polskacyfrowa.gov.pl/>.

140. <https://www.gov.pl/web/rodzina/rusza-nowa-edycja-programu-aktywni>.

141. <https://www.gov.pl/web/cppc/publiczny-internet-dla-kazdego>.

142. <https://www.funduszeuropejskie.gov.pl/strony/o-funduszach/fundusze-europejskie-bez-barier/dostepnosc-plus/o-programie/>.

143. <https://www.gov.pl/web/cyfryzacja/kompetencje-cyfrowe>.

144. <https://ose.gov.pl/>.

145. <https://www.mobywatel.gov.pl/dwa-sprawy>.

146. <https://www.gov.pl/web/cyfryzacja/strategia-cyberbezpieczenstwa-rzeczypospolitej-polskiej-na-lata-2019-2024>.

147. https://www.parp.gov.pl/storage/publications/pdf/ROSS_2023_scalony_ost_popr.pdf.

148. <https://poir.parp.gov.pl/>.

149. <https://www.parp.gov.pl/component/site/site/bony-na-innowacje-dla-msp>.

150. <https://www.parp.gov.pl/component/grants/grants/przemysl-4-0>.

151. <https://www.gov.pl/web/ncbr>.

152. <https://www.gov.pl/web/baza-wiedzy/firma-bezpieczna-cyfrowo--nowy-program-wzmacniania-cyberbezpieczenstwa-w-msp>.

153. African Growth and Opportunity Act (AGOA), “Digital Trade in Africa: a tralac guide,” *Tralac*, September 26, 2024, <https://www.tralac.org/publications/article/15996-digital-trade-in-africa-a-tralac-guide.html>.

154. Ralph Mathekga, Bridging Africa’s digital divide (Africa: GIS Reports, June 2024), <https://www.gisreportsonline.com/r/africa-digital/>.
155. “About,” Digital.gov, (accessed October 24, 2024), <https://digital.gov/about/>.
156. 21st Century Integrated Digital Experience Act, H.R. 5759, 115th Cong. (2018)
157. “An advanced approach to accessibility,” Digital.gov, accessed October 24, 2024, <https://digital.gov/resources/an-advanced-approach-to-accessibility/>.
158. “Communities of Practice,” Digital.gov (accessed October 24, 2024), <https://digital.gov/communities/>.
159. Jessica Dine, “The Digital Inclusion Outlook: What It Looks Like and Where It’s Lacking” (ITIF, May 2023), <https://itif.org/publications/2023/05/01/the-digital-inclusion-outlook-what-it-looks-like-and-where-its-lacking/>.
160. “About Us,” Connect 313 (accessed October 24, 2024), <https://connect313.org/about-us/>.
161. Dr. Colin Rhinesmith, “Digital Inclusion and Meaningful Broadband Adoption Initiatives,” (Benton Foundation, January 2016), <https://www.benton.org/sites/default/files/broadbandinclusion.pdf>.
162. “Lift Zones,” Comcast (accessed October 24, 2024), <https://corporate.comcast.com/impact/digital-equity/lift-zones>.
163. “Internet Essentials,” Xfinity (accessed October 24, 2024), <https://www.xfinity.com/learn/internet-service/internet-essentials>.
164. Comcast, “Comcast Donates \$70,000 and Opens New Lift Zones at DC Dream Center and Sasha Bruce Youthwork- Bringing Total to 38 Lift Zones in Washington, D.C.,” news release, October 26, 2021, <https://beltway.comcast.com/2021/10/26/comcast-donates-70000-and-opens-new-lift-zones-at-dc-dream-center-and-sasha-bruce-youthwork-bringing-total-to-38-lift-zones-in-washington-d-c/>.
165. “Digital Literacy,” AT&T ScreenReady (accessed October 24, 2024), <https://screenready.att.com/digital-literacy/>.

