

# Digital Economy: A Leapfrogging Opportunity for Bhutan

*Calum Handforth and Tshoki Zangmo, UNDP*

## Introduction

Digital tools and technologies have the potential to accelerate the sustainable development of Bhutan. From the catalytic role of connectivity, to innovators and entrepreneurs leveraging emerging technologies such as artificial intelligence build new digital products and services. And Bhutan has recognised the importance of inclusive and societal-level digital public infrastructure such as national digital identity. This is the concept of the “digital economy”: how technology and innovation can drive new ways of working, build new sectors and opportunities, and shape new pathways to prosperity – including moving beyond traditional metrics of success, and perhaps towards the first digital “Sustainability Unicorn”.

But digitalisation also poses particular challenges to economic growth and risks exacerbating existing divides – or creating new ones. Similarly, identifying the roles – and comparative advantages – of the public and private sectors and civil society is essential in building a sustainable and inclusive national digital transformation journey. This article will explore the key tenets of the digital economy and what they could mean for Bhutan – including in the context of the latest Five-Year Plan. It will also address the opportunities and risks of “leapfrogging”. In particular, the article will identify how Bhutan can shape a digital economy that is founded on the country’s core priorities and principles – from sustainability to happiness – and grounded in Bhutan’s greatest national asset: the human capital of its population. And the potential for “digital transformation with Bhutanese characteristics” to position the country as a regional and global digital leader.

## Understanding the Good and the Bad of Digital Leapfrogging

Digital leapfrogging focuses on the role of digital tools and technologies for accelerating national development. It requires a reorientation in how a nation adopts technology, where both people and processes undergo shifts

to recognise how technology can be an effective tool of individual and national growth and development.<sup>1</sup> It involves harnessing digital tools, channels, and technologies to innovate or adapt existing processes, cultures, and business models. And it is about centering priorities of digital equality, to ensure that no one is left behind<sup>2</sup>

Digital leapfrogging can also bring challenges for Bhutan. Over dependence on digital technologies can heighten societal vulnerability to various risks, including cyber threats, data breaches, privacy concerns, and technological failures<sup>3</sup>. Leapfrogging can also risk exacerbating existing divides, for example the gender digital divide which sees women's participation in the digital economy as often lower than men's<sup>4</sup>. And prioritising digital channels and tools can also risk entrenching broader inequalities, in the context of a wider digital divide<sup>5</sup>.

The widespread adoption of digital technologies and the corresponding surge in internet usage also may contribute to adverse environmental consequences<sup>6</sup>. This includes heightened energy consumption, exacerbated e-waste generation, and increased carbon emissions stemming from data centres and electronic devices.

Overall, balancing technological advancement with cultural preservation is crucial for maintaining the unique identity and values of Bhutanese society in the face of digital transformation. And leveraging these important assets for Bhutan to support the digital development of other countries.

- 
- 1 Zakhochyi, Vitallian and Handforth, Calum., 'Return-on-Investment in National Digital Transformation: Exploring the Development Impact of Digital', UNDP. Accessed April 2024: <https://www.undp.org/publications/dfs-return-investment-national-digital-transformation-exploring-development-impact-digital>
  - 2 UNDP and ITU, 'SDG Digital Acceleration Agenda', 2023. Accessed April 2024: <https://www.sdg-digital.org/>
  - 3 Microsoft, 'Over-reliance on AI: Literature Review'. Accessed April 2024: <https://www.microsoft.com/en-us/research/uploads/prod/2022/06/Aether-Overreliance-on-AI-Review-Final-6.21.22.pdf>
  - 4 Web Foundation, 'The Costs of Exclusion: Economic Consequences of the Digital Gender Gap'. Accessed April 2024: <https://webfoundation.org/research/costs-of-exclusion-report/>
  - 5 Signé, Landry, 'Fixing the global digital divide and digital access gap'. Accessed April 2024: <https://www.brookings.edu/articles/fixing-the-global-digital-divide-and-digital-access-gap/>
  - 6 Harding, Xavier, 'The Internet's Invisible Carbon Footprint'. Accessed April 2024: <https://foundation.mozilla.org/en/blog/ai-internet-carbon-footprint/>

## Sensing Global Trends in the Digital Economy

Digital technology is reshaping how we live and how we work, creating new opportunities and sectors and inspiring new ideas. Businesses are going online, data is a crucial commodity<sup>7</sup>, and people are more connected than ever before. There is a growing demand for digital technologies in driving economic growth, innovation, and productivity across various sectors and industries. Governments are also playing key roles in driving this potential, and in ensuring that digital tools and technologies lead to the greatest possible benefits.

This direction is expected to continue as advancements in technology continue to drive innovation and efficiency. From the growth of digital payment methods, to the ways that smartphones and digital platforms have transformed the job market through the emergence of new digital roles and the phasing out of traditional occupations, the creation of new ways of working, and increased demands on individuals to adapt their skill sets to meet market needs. Advancements in digital technology have also facilitated remote work opportunities, fostering the emergence of digital nomads and flexible work arrangements. At a foundational level, the democratisation of information access through the internet has also empowered individuals with knowledge, fuelling social progress and driving positive change on a broader scale.

These changes and developments have fundamentally reshaped our societies and economies, and can be seen as “platform shifts”<sup>8</sup> whereby the introduction of a particular technology –the internet or smartphones – creates unexpected and unanticipated change. We may be on the cusp of an important new transition. The emergence of Generative AI hints at exciting possibilities, but also the inherent challenges and complexities in ensuring that any new technology is used for the greatest benefit.

## Exploring Bhutan’s Current Digital Economy Landscape

The Kingdom of Bhutan has been a long explorer of the digital landscape.

7 World Bank, ‘World Development Report 2021: Data for Better Lives’. Accessed April 2024: <https://www.worldbank.org/en/publication/wdr2021>

8 Evans, Benedict., ‘AI, and Everything Else’. Accessed April 2024: <https://www.ben-evans.com/presentations>

Bhutan embarked on its digital journey in the late 1990s, marked by the introduction of television broadcasting and internet access. Bhutan, thereafter, aimed to anchor its economy and society around technological advancements. The Bhutan Information Communications Technology (ICT) Policy and Strategy (2004) was an important marker, whilst the e-Government Master Plan (2012-2017) articulated a vision to revolutionise government services through technology and stimulate the growth of a digital economy.

A significant push towards fostering a digital ecosystem was initiated through the implementation of the extensive Digital Drukylul Flagship (DDF) programme, within the 12th Five-Year Plan. The project was geared towards enhancing citizens' satisfaction with public services through the implementation of end-to-end Integrated Online Citizen Services and Integrated Online Business Licensing. Additionally, the establishment of the GovTech agency in 2022 served as a cornerstone in Bhutan's technological advancement. GovTech was tasked with driving the country's digital transformation, emphasising efficiency and effectiveness across government.

Digital initiatives in Bhutan are generating job opportunities. These developments reflect the convenience, accessibility, and trust that individuals and businesses have in digital technologies. This trust has been hard-won, founded on developing strong digital literacy in the population. In particular, there has been a concerted endeavour to strengthen the digital skills of Bhutanese youth. And this work continues. The recent adoption of the National Digital Identity Bill in 2023 marks a significant milestone, paving the way for the establishment of a robust legal framework that will streamline processes and enhance accessibility to various services while enhancing data security measures.

Along with exciting progress, important gaps and challenges remain. In particular, Bhutan faces significant infrastructure limitations, including limited access to reliable and affordable internet connectivity. The accessibility of digital products and services can also vary, with a digital divide that disproportionately affects rural areas and certain demographic groups – and exacerbates existing inequalities. Addressing these and other challenges requires concerted efforts from government, businesses, and civil society.

## Digital Transformation with Bhutanese Characteristics

Bhutan is at an important moment in its development and digital development journey. Strong foundations, and new ideas and technologies are overcoming geographic challenges. A promising digital ecosystem is taking shape. The country's digital leadership and vision is strong, and digital initiatives are recognised as a key development priority and catalyst. The 13th Five-Year Plan is founded on the three key pillars of “prosperity”, “people”, and “progress”. Each are key enablers of success in the context of the digital economy, but digital development is also an important tool in accelerating achievements in all three pillars – and driving “leapfrogging”.

There is exciting opportunity to position Bhutan as a regional, and global, digital leader. In particular, to shape a global demonstration and dialogue of “digital with Bhutanese characteristics”. Building digital tools, processes, thinking, and successes that showcase how digital tools and technologies – when applied inclusively, thoughtfully, and sustainably – can lead to important development success. And how this new way of digital thinking, drawing on the unique cultural and broader heritage of Bhutan, can drive global digital advancements that directly mitigate, tackle, and respond to the negative externalities of digital transformation that have emerged in other settings. From the rise of digital technology related social alienation<sup>9</sup> and unhappiness, to increases in e-waste<sup>10</sup>, and a concept of success that has prioritised platforms, and not people<sup>11</sup>.

## Digital Technologies Driving Increased Prosperity

The digital realm is fostering the emergence of new industries and opportunities. People are building digital businesses, and using online remote working platforms as a core earning opportunity. Driving coherence in this context is crucial. This includes establishing an entrepreneurship policy framework to develop, strengthen and direct important regulatory,

---

9 UNDP, Forthcoming.

10 World Health Organization, ‘Electronic waste (e-waste)’, Accessed April 2024: [https://www.who.int/news-room/fact-sheets/detail/electronic-waste-\(e-waste\)](https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste))

11 Handforth, Calum and Meddeb, Riad, ‘We need Smarter Cities, not ‘smart cities’’, MIT Technology Review, June 2022. Accessed April 2024: <https://www.technologyreview.com/2022/06/27/1053896/we-need-smarter-cities/>

policy, and broader efforts<sup>12</sup>. Identifying specialisation opportunities is also crucial, demonstrated in other settings where more focused skills can have important benefit<sup>13</sup>. And ensuring that key digital foundations are strong.

In addition, combining broad ecosystem support with focused engagement with a higher-end start-up cohort can also deepen the potential for success (as was seen with “Start-Up Chile”<sup>14</sup>). And externally-focused efforts are crucial. This includes shaping and promoting a formal remote work ‘offer’ to the international digital marketplace, but also exploring the scope to establish digital “testbeds”<sup>15</sup>. Bhutan has several ‘challenges’ – difficult topography, being landlocked, a challenging context of connectivity – that would be of considerable interest to innovators shaping emerging markets and “last mile” propositions. Developing a testbed (or number of testbeds) could attract innovators and investment and provide local skills and technology transfer opportunities.

Partnerships are also key in this context. As an example, the National Broadband Initiative (NBI) in Malaysia, launched in 2010, involves a public-private partnership with Telekom Malaysia Berhad to deploy high-speed broadband infrastructure, covering both supply and demand aspects of broadband. This includes the rollout of wired and wireless connectivity, alongside initiatives to boost awareness, attractiveness, and affordability to stimulate demand. Community access is emphasised through Rakyat Internet Centres, Mini Community Broadband Centres, and the distribution of netbooks to underprivileged students. Affordability incentives and the high-speed broadband widens access.

- 
- 12 OECD, ‘SME and entrepreneurship policy frameworks across OECD countries: An OECD Strategy for SMEs and Entrepreneurship’, Accessed April 2024: <https://www.oecd.org/economy/sme-and-entrepreneurship-policy-frameworks-across-oecd-countries-9f6c41ce-en.htm>
- 13 GSMA, ‘Building ecosystems: identifying tech start-up enablers in ASEAN’, Accessed April 2024: <https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2022/06/Building-ecosystems-identifying-tech-start-up-enablers-in-ASEAN.pdf>
- 14 WIPO Magazine, ‘Start-Up Chile’, Accessed April 2024: [https://www.wipo.int/wipo\\_magazine/en/2014/05/article\\_0006.html](https://www.wipo.int/wipo_magazine/en/2014/05/article_0006.html)
- 15 A ‘testbed’ is a defined setting – physical or virtual – whereby innovators (and partners, including policymakers) can test innovations in controlled settings.

## Digital Technology Providing Benefits to People

Researchers have highlighted a “twin-technology” challenge<sup>16</sup> whereby basic digital needs must be met, but engagement with the potential (and risks) of emerging technologies cannot be ignored. The former includes strengthening digital infrastructure, enhancing digital banking, reinforcing key digital and broader protections (including intellectual property protections). Increased focus on strengthening the local digital community – including networking opportunities, events, and celebration<sup>17</sup> – are also crucial. And this includes formalising freelancers and remote workers, who are not recognised or understood in the same way as ‘traditional’ workers and sectors.

Deeper efforts will also prove impactful. This includes developing the business management skills of freelancers (and the scope to explore these assets as proxy credit-scores<sup>18</sup>), and ensuring digital literacy is a lifelong learning proposition – and that related “softer” skills, including iteration and experimentation (and the ability to fail, and to try again) are also shaped. The government can play a catalytic role in this context. First, by establishing a “government-as-a-customer” approach – recognising that the public sector is a sizeable customer for local vendors, and there is scope to better engage national talent. Second, through establishing “Digital Marketplaces”<sup>19</sup> for mutual benefit: providing the government with short-term technical talent, and strengthening the credibility of local workers seeking to demonstrate their skills on the international digital marketplace.

The Government of Bangladesh’s a2i Teacher’s Portal initiative stands out as a remarkable example of using technology to advance inclusive learning. It serves as the largest repository of online educational content in the country, engaging over 575,000 active members and serving as a major

16 Le Thu, Huong, ‘Vietnam’s Twin Tech Challenge: Spearheading While Catching Up’, CSIS. Accessed April 2024: <https://www.csis.org/analysis/vietnams-twin-tech-challenge-spearheading-while-catching>

17 Hooper, Joe and Handforth, Calum, ‘How celebrating governments’ successes can lead to a better world’, UNDP. Accessed April 2024: <https://www.undp.org/blog/how-celebrating-governments-successes-can-lead-better-world>

18 UNDP, ‘Universal Trusted Credentials: Transforming Access to Finance for MSMEs and Beyond’. Accessed April 2024: <https://www.undp.org/policy-centre/singapore/publications/universal-trusted-credentials>

19 See, for example, the Github pages for the Digital Marketplaces from the governments of the UK, Canada, and Australia.

professional development platform for educators. Embracing blended learning, it combines traditional classroom methods with online digital resources while prioritising the improvement of teachers' fundamental digital skills nationwide. It also functions as a platform for peer-to-peer learning and capacity building, and aims to bridge the urban-rural digital gap, ensuring equal access to knowledge across Bangladesh.

## Digital Technology Enabling Important Progress

Digital transformation has the potential to enable leapfrogging, and exciting development progress<sup>20</sup>. However, this shift does not happen overnight<sup>21</sup> and many of the key aspects of digital success are often analogue. This includes investment, strategic direction and leadership, and changing organisational cultures and individual mindsets. Beginning this transformation can be difficult, however establishing a 'National Entrepreneur-in-Residence' – and being the first country in the world to do so – could catalyse this journey through providing strategic and broader leadership and guidance to senior government leaders.

Further national and international efforts could also prove impactful. First, piloting an “E-Residency”<sup>22</sup> concept to demonstrate the country's digital leadership could lead to positive engagement. Second, Bhutan should redouble efforts to engage the “Digital Diaspora” for mentorship of local start-ups and innovators, more formal digital collaborations and partnerships (and custom) and potentially even Angel investment. Other countries are recognising the potential of their respective diasporas<sup>23</sup>. Finally, a high-value but low-volume “Digital Nomad” programme should be launched. Targeted as an exclusive offer to global sustainability technology, wellness technology, and other aligned international digital

20 Zakhoshyi, Vitallian and Handforth, Calum., 'Return-on-Investment in National Digital Transformation: Exploring the Development Impact of Digital', UNDP. Accessed April 2024: <https://www.undp.org/publications/dfs-return-investment-national-digital-transformation-exploring-development-impact-digital>

21 E-Estonia, 'How do Estonians save annually 820 years of work without much effort?', Accessed April 2024: <https://e-estonia.com/how-save-annually-820-years-of-work/>

22 International digital entrepreneurs are keen to establish operations in stable markets and access reliable local business and financial services. E-Residency would offer international innovators access to the regional country markets and access to Bhutanese talent. Estonia is a pioneer in this regard, with the country's e-Residency initiative generating EUR37.7m in tax revenue in the first half of 2023.

23 TechPoint Africa, 'Nigeria enlists 120 experts to develop a framework for AI adoption'. Accessed April 2024: <https://techpoint.africa/2024/04/04/nigeria-enlists-experts-framework-ai-adoption/>



leaders, who are exploring shaping a digital “Sustainability Unicorn”<sup>24</sup> – a digital enterprise aiming to improve one billion lives – or similar.

Traditionally under-explored sectors, combined with digital technology, can have important impact. For example, many countries are devising strategies to support local content creators on both global and local scales. South Korea and Japan have emerged as prominent pioneers in cultivating digital content economies, recognising both the commercial opportunities and employment prospects within the industry. South Korea’s success in exporting K-pop culture notwithstanding, the country has leveraged its thriving online gaming industry to significant advantage. South Korean policies prioritise the public promotion of domestic digital content, backed by substantial investments in creator and startup incubator spaces.

### **Strengthening the Foundations**

Cross-cutting these priorities is the importance of building digital public infrastructure (DPI) to catalyse private sector innovation, and improve the reach, delivery, and effectiveness of public and private service delivery<sup>25</sup>. From digital payment mechanisms being used in India to accelerate digital adoption and uptake, to digital identity solutions in Singapore that improve service delivery, and data exchange mechanisms in Estonia that save the country a combined 800 years of work each and every year through better digital service delivery<sup>26</sup>.

Bhutan stands to gain valuable insights from India’s approach to DPI, which has played a pivotal role in the country’s progress in fostering extensive financial inclusion, establishing the digital framework for social welfare transfers and service accessibility, and catalysing transformative changes nationwide. Central to this infrastructure is the India Stack, often referred to as the JAM trinity, consisting of interconnected components: Jan Dhan (J) accounts offering free savings facilities, Aadhaar (A) biometric identification system providing unique digital identities, and

24 A ‘unicorn’ is a company with a valuation of US\$1bn or greater.

25 UNDP, ‘Accelerating The SDGs Through Digital Public Infrastructure: A Compendium of The Potential of Digital Public Infrastructure’. Accessed April 2024: <https://www.undp.org/publications/accelerating-sdgs-through-digital-public-infrastructure-compendium-potential-digital-public-infrastructure>

26 E-Estonia, ‘How do Estonians save annually 820 years of work without much effort?’, Accessed April 2024: <https://e-estonia.com/how-save-annually-820-years-of-work/>

Mobile (M) emerging as the primary conduit for financial service access. Augmented by the instantaneous Unified Payments Interface (UPI) and the recent introduction of the Open Network for Digital Commerce initiative, aimed at creating a unified open network for digital commerce, the DPI endeavors to level the business landscape, especially for SMEs, by providing a streamlined solution for digital transactions.

Bhutan is exploring and building many of these components, and the learning and success of these initiatives has important relevance to many other countries around the world. In this context, a “Bhutan-to-the-World” approach could see the country export its digital products and services – and accompanying implementation support – to other contexts (including smaller and landlocked countries).

## Conclusion

Across each of these three pillars, and the identified priorities, there are a number of shared prerequisites for success. In particular:

1. Ensuring a whole-of-government effort: although many initiatives include digital tools and technology propositions, their role in driving national development will require cross-government collaboration and a shared direction. This includes ensuring sufficient political capital to drive an approach that works across ministries and potential silos, and the usefulness of shaping a ‘Digital Advocate Network’ across the government<sup>27</sup>.
2. Refining collaboration and partnerships: strengthening the local ecosystem will require continued close collaboration between the public and private sectors (and civil society) – including public-private partnership development<sup>28</sup>. These efforts will include the importance of clear delineation: identifying the role and limits of each sector and avoiding crowding out respective efforts. Similarly, effective coordination between digitally-focused

27 Digital Nation, ‘State governments prepare for constant change’. Accessed April 2024: <https://www.digitalnationaus.com.au/feature/state-governments-prepare-for-constant-change-529821>

28 GovTech, ‘Accelerating digital transformation with public-private partnerships’. Accessed April 2024: <https://www.tech.gov.sg/media/technews/accelerating-digital-transformation-with-public-private-partnerships>

international development actors is crucial.

3. Embedding marketing and communications skills: many of the propositions require extensive engagement with international actors and markets, including showcasing the strengths and role of Bhutan. Dedicated and high-quality communications and marketing support is an essential component in positioning many of the more strategic propositions for success<sup>29</sup>.

Understanding success will be crucial: a paucity of locally-available data (and stretched data collection and analytical expertise) could constrain learning, development, and course correction of digital transformation. A more expansive monitoring, learning, and evaluation strategy needs to be developed – including leveraging innovative data collection methods through collaboration with the private sector and academia.

The digital economy is not the domain of a single actor or sector. But by fostering innovative partnerships and enabling the widespread adoption of digital tools and technologies among the people of Bhutan, the country can harness these resources to propel the growth of the digital economy. Sustainability and inclusivity must be central tenets of these efforts, ensuring that the benefits of digitalisation reach all segments of society, including marginalised communities. Similarly, leveraging Bhutan’s human capital is crucial in this endeavor, as investing in education and skill development will empower individuals to actively participate in and shape the digital economy.

Fundamentally, there is an important opportunity to build a leading regional and global approach of “digital transformation with Bhutanese characteristics” – shaping a unique digital journey for other countries to follow. It can leverage on the unique cultural, heritage, and individual institutional talents of Bhutan to respond to the issues that developments in the digital landscape are causing in other contexts. Bhutan is well-placed to shape and deliver a model of digital transformation for the twenty-first century, including perhaps being the foundation for the world’s first digital “sustainability unicorn”.

---

<sup>29</sup> See, for example, the TED Talk given by His Excellency Tshering Tobgay: [https://www.ted.com/talks/tshering\\_tobgay\\_this\\_country\\_isn\\_t\\_just\\_carbon\\_neutral\\_it\\_s\\_carbon\\_negative?language=en](https://www.ted.com/talks/tshering_tobgay_this_country_isn_t_just_carbon_neutral_it_s_carbon_negative?language=en)

## References

- Digital Nation. “State governments prepare for constant change.” Accessed April 2024. <https://www.digitalnationaus.com.au/feature/state-governments-prepare-for-constant-change-529821>.
- GovTech. “Accelerating digital transformation with public-private partnerships.” Accessed April 2024. <https://www.tech.gov.sg/media/technews/accelerating-digital-transformation-with-public-private-partnerships>.
- GSMA. “Building Ecosystems: Identifying Tech Start-Up Enablers in ASEAN.” Accessed April 2024. <https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2022/06/Building-ecosystems-identifying-tech-start-up-enablers-in-ASEAN.pdf>.
- E-Estonia. “How do Estonians save annually 820 years of work without much effort?” Accessed April 2024. <https://e-estonia.com/how-save-annually-820-years-of-work/>.
- Evans, Benedict. “AI, and Everything Else.” Accessed April 2024. <https://www.ben-evans.com/presentations>.
- Handforth, Calum, and Riad Meddeb. “We Need Smarter Cities, Not ‘Smart Cities.’” MIT Technology Review, June 2022. Accessed April 2024. <https://www.technologyreview.com/2022/06/27/1053896/we-need-smarter-cities/>.
- Harding, Xavier. “The Internet’s Invisible Carbon Footprint.” Accessed April 2024. <https://foundation.mozilla.org/en/blog/ai-internet-carbon-footprint/>.
- World Bank. “World Development Report 2021: Data for Better Lives.” Accessed April 2024. <https://www.worldbank.org/en/publication/wdr2021>.
- Hooper, Joe, and Calum Handforth. “How Celebrating Governments’ Successes Can Lead to a Better World.” UNDP. Accessed April 2024. <https://www.undp.org/blog/how-celebrating-governments-successes-can-lead-better-world>.
- Le Thu, Huong. “Vietnam’s Twin Tech Challenge: Spearheading While Catching Up.” CSIS. Accessed April 2024. <https://www.csis.org/analysis/vietnams-twin-tech-challenge-spearheading-while-catching>.
- Microsoft. “Over-reliance on AI: Literature Review.” Accessed April 2024. <https://www.microsoft.com/en-us/research/uploads/prod/2022/06/Aether-Overreliance-on-AI-Review-Final-6.21.22.pdf>.
- Organisation for Economic Co-operation and Development (OECD). “SME and Entrepreneurship Policy Frameworks across OECD Countries: An OECD Strategy for SMEs and Entrepreneurship.” Accessed April 2024. <https://www.oecd.org/economy/sme-and-entrepreneurship-policy-frameworks-across-oecd-countries-9f6c41ce-en.htm>.
- Signé, Landry. “Fixing the Global Digital Divide and Digital Access Gap.” Accessed April 2024. <https://www.brookings.edu/articles/fixing-the-global-digital-divide-and-digital-access-gap/>.

- TechPoint Africa. "Nigeria Enlists 120 Experts to Develop a Framework for AI Adoption." Accessed April 2024. <https://techpoint.africa/2024/04/04/nigeria-enlists-experts-framework-ai-adoption/>.
- Tobgay, Tshering. "This country isn't just carbon neutral, it's carbon negative." TEDTalk. Accessed April 2024. [https://www.ted.com/talks/tshering\\_tobgay\\_this\\_country\\_isn\\_t\\_just\\_carbon\\_neutral\\_it\\_s\\_carbon\\_negative?language=en](https://www.ted.com/talks/tshering_tobgay_this_country_isn_t_just_carbon_neutral_it_s_carbon_negative?language=en).
- United Nations Development Programme (UNDP). "Universal Trusted Credentials: Transforming Access to Finance for MSMEs and Beyond." Accessed April 2024. <https://www.undp.org/policy-centre/singapore/publications/universal-trusted-credentials>.
- UNDP. Accessed April 2024. <https://www.undp.org/publications/dfs-return-investment-national-digital-transformation-exploring-development-impact-digital>.
- UNDP and ITU. "SDG Digital Acceleration Agenda." 2023. Accessed April 2024. <https://www.sdg-digital.org/>.
- Web Foundation. "The Costs of Exclusion: Economic Consequences of the Digital Gender Gap." Accessed April 2024. <https://webfoundation.org/research/costs-of-exclusion-report/>.
- World Health Organization. "Electronic waste (e-waste)." Accessed April 2024. [https://www.who.int/news-room/fact-sheets/detail/electronic-waste-\(e-waste\)](https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste)).
- WIPO Magazine. "Start-Up Chile." Accessed April 2024. [https://www.wipo.int/wipo\\_magazine/en/2014/05/article\\_0006.html](https://www.wipo.int/wipo_magazine/en/2014/05/article_0006.html).
- Zakhozhyi, Vitalli, and Calum Handforth. "Return-on-Investment in National Digital Transformation: Exploring the Development Impact of Digital." UNDP. Accessed April 2024. <https://www.undp.org/publications/dfs-return-investment-national-digital-transformation-exploring-development-impact-digital>.