

4

DIGITAL FINANCIAL SERVICES

David L. Shrier

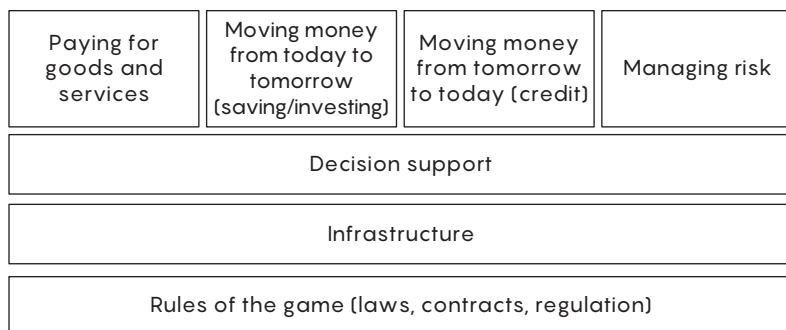
4.1 INTRODUCTION

Digital financial services (DFS) offers a vehicle by which the gap can be bridged between the 3.5 billion people who are underserved or unserved by financial services today, and the cost and compliance requirements that international laws and regulation mandate. While many digital financial services are delivered through mobile devices (mobile financial services), the more comprehensive services also capture nonmobile technologies, such as Paytm, which is used in India.

4.2 CONTEXT

In contemplating DFS, it is useful to have a framework of the financial services system. Figure 4.1 was developed by Professors Peter Tufano (Saïd Business School, University of Oxford) and Robert Merton (MIT Sloan School of Management) to provide a functional explanation of how the global financial system works.

Broadening financial access through digital means can unlock productivity and investment, reduce poverty, empower women, and help build stronger institutions with less corruption—all while providing a profitable, sustainable business opportunity for financial services providers. The benefits for individuals,

**FIGURE 4.1**

Framework of the financial services system.

Source: Adapted from D. B. Crane, K. A. Froot, S. P. Mason, A. Perold, R. C. Merton, Z. Bodie, E. R. Sirri, and P. Tufano, *The Global Financial System: A Functional Perspective* (Boston: Harvard Business School Press, 1995).

businesses, and governments can transform the economic prospects of developing economies.¹

DFS often fills the gap left by banks that have been unable or unwilling to service those at the bottom of the wealth and income scales, and is often driven by nonbank financial institutions that are providing the financially excluded with an alternative to reliance on cash as a means of payment and transfer.²

Most people and small businesses in developing economies today do not fully participate in the formal financial system. They transact exclusively in cash, have no safe way to save or invest money, and do not have access to credit beyond informal lenders and personal networks. Even those with financial accounts may have only limited product choices and face high fees.³ In more developed countries, the banking experience has left many feeling frustrated, and financial institutions often receive negative customer satisfaction ratings (expressed as a Net Promoter Score).

Using digital channels rather than brick-and-mortar branches dramatically reduces costs for providers and increases



FIGURE 4.2

Three dimensions of DFS.

Source: D. Shrier, “Digital Financial Services” (webinar, University of Oxford, Women’s World Banking, Alliance for Financial Inclusion “Leadership and Diversity for Regulators,” June 13, 2019).

convenience for users, giving people at all income levels and in far-flung rural areas access to financial services. For businesses, financial services providers, and governments, digital payments and DFS can erase vast inefficiencies and unlock significant productivity gains.

As we consider the digitization of financial services, it’s useful to add a second, simplified functional model that examines the layers of the digital realm. The model in figure 4.2 focuses on three specific dimensions of DFS, disaggregating them from the broader context of the Tufano functional model.

These foundational layers of DFS provide a ready way for a central banker to understand where a particular offering fits into the “stack.”

4.3 DESCRIPTION

We will now examine the core elements of DFS using this simplified three-layer model:

- *Transactions:* movement of money from one person to another, from a person to an organization (such as a bank,

a company, or a government), from an organization to a person, or from one organization to another organization.

- *Identity*: a model of uniquely representing a person or organization. Identities can be derived from government documents, corporate-issued identifiers (such as the DUNS number from Dun & Bradstreet or the Legal Entity Identifier), biometric data, financial data, or other sources.
- *Systems*: the infrastructure that lies underneath other activities. It can include communications networks, hardware, software, and other technologies.

While most instances of DFS at the transaction and identity layers are delivered through mobile platforms, a number of deployments of DFS are delivered digitally but not via mobile devices. Paytm is an example (see below).

Transaction-layer DFS Payments, remittances, and transfers have been revolutionized by digital technologies. Private companies such as M-Pesa and Bitpesa, both based in sub-Saharan Africa, have introduced lower-cost, higher-throughput transactions. In doing so, they have reduced cross-border remittance rates from 12–15 percent to 1 percent or less by replacing antiquated systems that use layers of manual labor and rent-extracting intermediaries with digital technologies. Bitpesa, for example, replaced Western Union activities with bitcoin technology to manage and account for the movement of money from one account to another. Peer-to-peer payments systems eliminate some conventional functions of the banking system and lower costs. Transactions and payments, which are perhaps the most common financial activity by an individual, have provided the entry point for financial inclusion for millions. Some market providers engage in a hybrid model where a human agent, digitally connected by a smartphone, interacts in person with a consumer. By pairing the technology with a human face, this hybrid model helps overcome some of the mistrust in certain countries toward digital systems.

Identity-layer DFS Identity is a keystone issue for societal and financial inclusion. Three and a half billion people are underbanked or unbanked,⁴ and approximately 1 billion (mostly women and children) lack any legal identity.⁵ In addition, small businesses lack adequate corporate identity functions, directly related to the fact that 65 million formal micro, small, and medium-sized enterprises are underbanked or unbanked.⁶ Credit, whether for consumers or small businesses, is an identity attribute; it is derived from the actions of the consumer or business and is tied to other identifiers such as a national ID number or business ID number (in other words, it is an enhanced set of data that is attached to that identity). A credit profile is a subset of your identity attributes. Digital data streams, including transaction-layer data, are providing inputs for the new forms of credit modeling, driven by alternative data, and are enabling lending to a broader audience. New data portability (driven by open banking regulations⁷) empowers consumers by giving them control over their personal identity-linked data.⁸ Identity is discussed at greater length in the “Digital Identity” section of the “Commonwealth Fintech Toolkit” and in the 2019 book *Trusted Data* (Hardjono, Shrier, and Pentland: MIT Press).⁹

Systems-layer DFS Digital technologies are helping to modernize systems-level activities in various banking environments as well as enable better security across all dimensions of infrastructure. The gaps across components of the financial system can be quite large; some developing economies lack even basic process flow systems for loans (processing loan applications on paper forms, and doing so poorly). New digital platforms can help with this transition. Blockchain-based systems are enabling interbank transfers at a dramatically reduced cost and increased speed (see the “Blockchain” section of the “Commonwealth Fintech Toolkit”).¹⁰

It is worth mentioning types of DFS that are not mobile. One example is Paytm, a machine similar to an ATM that allows a consumer to transfer money, pay bills, and engage in other

financial services activities without having to own a mobile phone, a smartphone, or a computer with telecommunications connectivity. It is a vehicle for financial access for some of the poorest individuals.

The critical building blocks for effective DFS, according to the think tank Consultative Group to Assist the Poor, are illustrated in box 4.1.

Box 4.1

Four Building Blocks for Effective DFS Regulation

Based on its work in 10 countries in Africa and Asia, non-profit think tank CGAP (the Consultative Group to Assist the Poor) has identified four building blocks for creating an enabling and safe DFS regulatory framework. These four building blocks are:

- **E-money issuance by nonbanks**—A basic enabling condition for DFS is a special licensing window for nonbank e-money issuers (EMIs).
- **Use of agents**—Retail agents make inclusive DFS possible and are therefore a key focus of enabling regulation. Providers use agents—third parties such as retail shops—to provide customers easy access to their services close to where they live, thus expanding their outreach at relatively low incremental cost.
- **Risk-based customer due diligence**—DFS operate within regulatory contexts shaped by policies on anti-money laundering and countering the financing of terrorism (AML/CFT). Proportionate AML/CFT frameworks use a risk-based approach to protect the integrity of the system while imposing the least burden on DFS outreach.
- **Consumer protection**—In order to drive financial inclusion, DFS must cultivate trust and reliability, and this in turn depends on effective financial consumer protection (FCP).

Source: Reproduced from Consultative Group to Assist the Poor, “Regulation for Inclusive Digital Finance,” accessed July 11, 2021, <https://www.cgap.org/topics/collections/regulation-inclusive-digital-finance>.

4.3.1 The Role of Central Banks in DFS

Government bodies, and central banks in particular, have a crucial role to play in the success or failure of the implementation of DFS in a country.

Enabling environments The regulatory environment allowing provision of DFS is said to be “enabling” or “nonenabling,” terms first used by the mobile communications industry’s non-profit trade association, the GSMA, in relation to the impact of local regulatory regimes on provision of DFS.¹¹ The “enabling” component refers primarily to whether any and all nonbanks can independently provide DFS without a (mandated, “nonenabling”) need to partner with a licensed bank for that purpose.¹²

Central bank In most jurisdictions, the central bank’s role as the apex bank in the country establishes it as the lead regulator in DFS. It will, at a minimum, set licensing and authorization criteria for DFS providers and e-money issuance; establish consumer protection mechanisms; set safety and soundness guidelines including schemes for safeguarding of pooled funds and user accounts; set AML/KYC (“anti-money laundering” and “know your customer”) policies for use by the financial sector; establish quality of service and risk management guidelines for services; set agent standards; and often also set interoperability standards and policies. In some cases it may also act in a catalytic role of establishing or building a national interoperable platform or switch that integrates a DFS ecosystem with its e-money-based financial services provider and agent networks with “traditional” financial ecosystems such as those involving ATM and card networks.¹³

Businesses and government leaders will need to make a concerted effort to secure the potential benefits of DFS. Three building blocks are required: widespread mobile and digital infrastructure, a dynamic business environment for financial services, and digital finance products that meet the needs of individuals and small businesses in ways that are superior to the informal financial tools they use today.

4.3.2 Examples of DFS Deployments

A number of Commonwealth nations have had significant success in deploying DFS.

Kenya M-Pesa and similar DFS are representative of the mobile banking revolution in Kenya: financial institutions have embraced M-Pesa as a platform to manage microaccounts, build customer deposits, and broaden their customer network. Consequently, Kenya has emerged as a leader in financial inclusion in sub-Saharan Africa. In 2006, just before M-Pesa was launched, only 26.7 percent of Kenyans had access to formal financial services (such as bank accounts and money transfers); this figure now exceeds 80 percent.¹⁴

Zambia The Zambia National Commercial Bank (Zanaco) invested in a distinctive brand for financial inclusion. Zanaco successfully launched Zambia's first mobile banking service, Xapit, in 2008. The Xapit account, which a customer can open at the bank in only minutes, offers a VISA card and other banking services over a mobile phone. Targeting Zambia's underbanked markets, Xapit now serves more than two hundred thousand customers and conducts more than 1 million transactions per month. Xapit users include other Zanaco customers that have easy access to the product through their "current accounts" (checking or savings accounts).¹⁵

Malawi Having launched the first mobile money pilot in 2012, Malawi has seen the number of adults using DFS leapfrog from 1,000 to 2.3 million active users as of June 2018, representing 25 percent of the adult population. This tremendous growth was highlighted in the 2017 Global Findex, released by the World Bank in April 2018. The Reserve Bank of Malawi (RBM) has played an important role in creating a regulatory environment that has fostered private-sector-led innovation and growth. RBM permits both banks and nonbank financial institutions to offer DFS. Critical laws passed by parliament in 2016, including the Payment Systems Act, the E-Transactions

Act, and the Communications Act, have provided a guide to further development of the DFS market. Following the Payment Systems Act, RBM issued a directive in September 2017 mandating interoperability of DFS through the National Switch, a central part of the telecommunications infrastructure. Malawi has also achieved what is considered the “dream” of many countries, which is “interoperability” (or seamless communications) between mobile network operators (MNOs).¹⁶

Nigeria According to the World Bank’s 2016 *World Development Report*, the 2012 Growth Enhancement Support Scheme introduced mobile technology to transfer fertilizer subsidies directly to farmers, taking the government out of the business of procuring and distributing fertilizer. The support scheme now helps up to twice as many farmers at one-sixth the cost. The transfer system relies on a database of more than 10.5 million farmers, who, as registered recipients of the subsidies, now have a better chance of gaining access to formal or regulated financial services. This initial success has led to an expansion of the system, aided by a digital identification system and biometric signatures, taking financial services far into Nigeria’s rural hinterland.¹⁷

India Paytm is a digital payments platform that enables online as well as cash deposits via select banks and partners to be transferred into an integrated wallet. Once the Paytm wallet is prepaid, it can be used to pay for a number of goods and services without having to use cash—for example, topping up minutes on a mobile phone, paying utility bills, paying travel fares and booking hotels, buying tickets for movies, and making online purchases.¹⁸ The funds held in the Paytm wallet are protected under an escrow account (a type of account where funds are released once an agreement is fulfilled).¹⁹

Bahamas In May 2019, the Bahamas Central Bank entered into an agreement to deliver the first national digital currency by 2020 with NZIA as its key collaborator, along with the

Singapore-based software development firm Zynesis. Called the Sand Dollar, the initiative is intended to deliver access, compliance with regulation, and, most importantly, to create climate resilience around the economy after Hurricane Dorian literally blew away the life savings of many residents.²⁰

United Kingdom Monzo is seeking to provide basic financial access for asylum seekers in the United Kingdom, which CEO Tom Blomfield feels would be accelerated by better digital identity. OakNorth, in turn, believes that coordinated access to government data could assist with lending to small and medium-sized enterprises.²¹

4.4 KEY CONSIDERATIONS FOR FUTURE DEVELOPMENT

4.4.1 Critical Issues and Obstacles in DFS

A number of issues have arisen in the past several years as DFS has begun to gain widespread adoption:

- Digital inclusion/exclusion
- Rising usury
- Paradigm limits (KYC)
- Privacy
- Cybersecurity
- Financial literacy

Digital inclusion/exclusion Financial inclusion is driven by digital inclusion, but digital inclusion remains such a large problem globally that it has been identified as a UN Sustainable Development Goal (SDG 9).²² It also offers opportunity: for every 10 percent increase in internet penetration, there is an increase of 1.35 percent in GDP.²³ A total of 3.8 billion people still lack fast and reliable internet, making digitally delivered financial services a difficult endeavor.²⁴ The fact that the world seems mired at about 54.8 percent connectivity, with a

slowing growth rate (2.9 percent), inhibits the potential for financial inclusion via DFS.²⁵ Gender ratios are further exacerbating the problem, with 313 million fewer women than men using mobile internet in low- and middle-income countries, according to the GSMA.²⁶ To advance policy outcomes around DFS that seeks to drive inclusion, a systems view is needed—for example, Africa is predicted to have more than 700 million smartphones by 2025, up from 302 million in 2018,²⁷ but access to power and access to bandwidth remain limiting factors, so the entire array of technologies and services needs to be considered and supported.

Rising usury DFS inclusion platforms have been criticized for high interest rates, forming an effective “poor tax” whereby poorer people have to pay higher rates than wealthier people on a like-for-like basis. The question is being raised, in an era of historically low interest rates in developed nations (in some cases negative interest): Why is it that developing economies and underbanked/unbanked populations remain subject to high-cost loans? At the same time, policy initiatives to try to limit interest rates in some economies have had the unintended consequence of making it uneconomical for companies to compete, and several players have left the market. Economists argue about a variety of solutions; Leora Klapper of the World Bank, among others, argues strongly for policy tools such as fostering competition and reducing cost of funds to lenders rather than interest rate caps.

Paradigm limits (KYC) An identity-linked challenge is how current KYC regulations are interpreted. KYC currently requires a physical address tied to a customer. This prompts the question of how to perform a KYC check on someone who doesn’t have a formal address. New technologies from mobile phones can deliver GPS coordinates and device-acquired biometrics that can provide high-resolution means of identifying customers in a manner that is better and more secure than

current methods. Some domiciles are exploring alternate methods of identifying individuals along these lines.

Privacy Alternative data introduces new issues regarding digital privacy, causing citizens to lose the “anonymity of crowds.” Telecommunications and bank data sets can also breach personal privacy in new ways, such as (if misused) enabling targeting of ethnic groups and discrimination against protected classes. In the past three years, elections have been increasingly manipulated by the use of personal data. The General Data Protection Regulation provides a model for addressing personal sovereignty of data, but regulators struggle to apply it.

Cybersecurity Applying a cyber lens to the simplified three-layer model of DFS, we see that new vulnerabilities arise at each layer of the DFS stack. Transactions lead to transaction fraud; identity experiences identity theft; easily accessed computer systems lead to systems hacks. Figure 4.3 shows how cybersecurity fits into our DFS model.

The downstream impacts of cybersecurity issues are consequential. Rising fraud and identity theft rates reverse financial inclusion. For example, false decline rates are highest



FIGURE 4.3

Cybersecurity in the DFS model.

Source: D. Shrier, “Digital Financial Services” (webinar, University of Oxford, Women’s World Banking, Alliance for Financial Inclusion “Leadership and Diversity for Regulators,” June 13, 2019).

in emerging markets (e.g., Bangladesh, sub-Saharan Africa, Colombia, Mexico) with 50 percent or more of transactions being declined because fraud systems are unable to determine whether the transaction is from a legitimate customer or a hacker. Systems-level hacks undermine confidence in the banking system, decreasing comfort among consumers and businesses to grow deposits.

Financial literacy Modest levels of financial literacy make adoption of DFS difficult at times. In interviews with central banks, it was found that they had experienced consumers questioning new offerings because they didn't understand the need for a savings account or a credit facility, indicating that greater investment in financial literacy is needed.

4.4.2 Future Opportunities

DFS offer a powerful tool for inclusion and improved economic velocity. A systems view of DFS should include efforts around the following:

- Greater financial literacy
- More investment in modern technology infrastructure
- Policy interventions to engage and empower the private sector
- Consumer protections informed by a sophisticated view about the effects of different DFS offerings

A characteristic of digital finance has been the rise of nontraditional providers of financial services such as money transfers, savings, and lending. This raises several concerns, as highlighted in the World Bank's World Development Report,²⁸ which I summarize below.

One concern is that traditional financial regulation does not always cover these companies or that they are held to a different standard, such as reduced oversight, even though they can scale up quickly. These problems are somewhat similar to the

“shadow banking problem” that preceded the global financial crisis, and regulators are exploring ways to shift from regulating entities to regulating activities.

A second concern is that digital finance is bringing large numbers of people into the financial system for the first time. This requires strong consumer education, financial literacy, and consumer protection, including promoting financial literacy and fraud prevention, dispute resolution mechanisms, and data privacy.

A third concern is that financial innovations could pose a systemic risk to a country’s banking sector, including credit, liquidity, operational, and consumer risk. Prudential regulation of digital finance reduces this risk, but it may involve high compliance costs that raise barriers to entry, and thus to competition.

Risks to the banking system were raised about bitcoin, but analysis by the Bank of England, for instance, suggested that most digital currencies play too small a role (at present) to threaten financial stability.²⁹ A greater concern may be that financial innovations create distortions in financial markets that could have larger implications. For example, if automation and big data approaches make it much easier to issue consumer credit but not commercial credit, financial institutions might overallocate to the former, potentially creating a credit bubble and reducing credit availability for investments that increase productivity.

However, despite many countries’ general dismissiveness toward the systemic risks presented by bitcoin, new questions have been raised with the advent of Libra, a private consortium of companies led by Facebook that is seeking to deploy a multinational digital currency, on the one hand, and the RMB Coin, issued by the People’s Bank of China, on the other. In August 2019, outgoing Bank of England governor Mark Carney called for a digital currency that would be backed by a

number of countries and that would address US dollar hegemony as well as rising concerns around Libra and RMB Coin.³⁰

Finally, there are concerns about increased fraud in the financial system. With the rise of electronic banking, cyberattacks on financial institutions and on other sectors processing electronic financial transactions have increased. Massive theft of credit card information from retailers has highlighted the stakes involved. Larger financial institutions have the resources and know-how to continuously upgrade online and mobile security through tools such as encryption or strong authentication. In fact, banks have been at the forefront of developing secure transaction processes. But smaller and non-financial institutions may be more at risk. Apart from monetary losses, a large risk is also a loss of trust in digital financial systems that may hinder further innovation in the sector.

NOTES

This chapter previously appeared in a substantially similar form as part of the Commonwealth, “Commonwealth Fintech Toolkit,” September 2020, <https://thecommonwealth.org/our-work/commonwealth-fintech-toolkit>.

1. McKinsey & Company, *Digital Finance for All: Powering Inclusive Growth in Emerging Economies*, 2016, <https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Employment%20and%20Growth/How%20digital%20finance%20could%20boost%20growth%20in%20emerging%20economies/MGI-Digital-Finance-For-All-Executive-summary-September-2016.ashx>.

2. L. Perlman and M. Wechsler, “Mobile Coverage and Its Impact on Digital Financial Services,” *SSRN Electronic Journal*, 2019, <https://dfsobservatory.com/sites/default/files/Mobile%20Coverage%20and%20its%20Impact%20on%20Digital%20Financial%20Services%20-%20PUBLIC.pdf>.

3. McKinsey & Company, *Digital Finance for All*, 7.

4. Chamber of Digital Commerce, “Blockchain and Financial Inclusion: The Role Blockchain Technology Can Play in Accelerating Financial Inclusion” (working paper, March 2018), <https://digitalchamber.org/assets/blockchain-and-financial-inclusion.pdf>.
5. ID4D global data set (web page), World Bank, 2018, <https://id4d.worldbank.org/global-dataset>.
6. International Finance Corporation, *MSME Finance Gap: Assessment of the Shortfalls and Opportunities in Financing Micro, Small and Medium Enterprises in Emerging Markets*, 2017, <https://www.ifc.org/wps/wcm/connect/03522e90-a13d-4a02-87cd-9ee9a297b311/121264-WP-PUBLIC-MSMEREportFINAL.pdf?MOD=AJPERES&CVID=m5SwaQA>.
7. M. Zachariadis and P. Ozcan, “The API Economy and Digital Transformation in Financial Services: The Case of Open Banking” (SWIFT Institute Working Paper No. 2016-001, 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2975199.
8. B. Chakravorti, “Why It’s So Hard for Users to Control Their Data,” *Harvard Business Review*, January 30, 2020.
9. The Commonwealth, “Commonwealth Fintech Toolkit”; T. Hardjono, D. L. Shrier, and A. Pentland, *Trusted Data: A New Framework for Identity and Data Sharing*, rev. and exp. ed. (Cambridge, MA: MIT Press, 2019).
10. The Commonwealth, “Commonwealth Fintech Toolkit.”
11. For the GSMA view, see S. di Castri, “Mobile Money: Enabling Regulatory Solutions,” SSRN, 2013, <https://bit.ly/2kGPgqX>.
12. L. Perlman, “An Introduction to Digital Financial Services (DFS),” November 20, 2018, SSRN, <https://ssrn.com/abstract=3370667>.
13. Perlman, “An Introduction to Digital Financial Services.”
14. N. Ndung’u, “Practitioner’s Insight—M-Pesa, a Success Story of Digital Financial Inclusion,” Global Economic Governance Programme, University of Oxford, July 2017, <https://www.geg.ox.ac.uk/publication/practitioners-insight-m-pesa-success-story-digital-financial-inclusion>.

15. Accenture and Care International, *Within Reach: How Banks in Emerging Economies Can Grow Profitably by Being More Inclusive*, 2015, https://insights.careinternational.org.uk/media/k2/attachments/Within-Reach_CARE-Accenture-2015.pdf.
16. F. Mdwazika and N. Harihareswara, "Exciting Changes in Malawi DFS Market," *UN Capital Development Fund (UNCDF)* (blog), December 28, 2018, <https://www.uncdf.org/article/4270/exciting-changes-in-malawi-dfs-market>.
17. World Bank, *World Development Report 2016: Digital Dividends*, 2016, www.worldbank.org/en/publication/wdr2016.
18. "How to Recharge Your Mobile on Paytm," <https://paytm.com/offer/recharge/mobile-recharge-process>.
19. R. Sharma, "What Is Paytm, and How to Use Paytm Wallet?," *Gadgets 360*, December 30, 2016, <https://gadgets.ndtv.com/apps/features/what-is-paytm-and-how-to-use-paytm-wallet-1625271>.
20. H. Partz, "Bahamas Central Bank Enters Agreement to Deliver First National Digital Currency by 2020," *Cointelegraph*, May 29, 2019, <https://cointelegraph.com/news/bahamas-central-bank-enters-agreement-to-deliver-first-national-digital-currency-by-2020>.
21. H. van Steenis, chair, *Future of Finance: Review on the Outlook for the UK Financial System: What It Means for the Bank of England*, June 2019, <https://www.bankofengland.co.uk/-/media/boe/files/report/2019/future-of-finance-report>.
22. "Sustainable Development Goal 9: Build Resilient Infrastructure, Promote Inclusive and Sustainable Industrialization and Foster Innovation," United Nations, 2015, <https://sustainabledevelopment.un.org/sdg9>.
23. M. Minges, "Exploring the Relationship between Broadband and Economic Growth" (English), *World Development Report background papers* (Washington, DC: World Bank Group, 2016), <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/178701467988875888/exploring-the-relationship-between-broadband-and-economic-growth>.

24. Broadband Commission for Sustainable Development, *The State of Broadband: Broadband Catalyzing Sustainable Development*, September 2017, https://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-BROADBAND.18-2017-PDF-E.pdf.
25. "Global Internet Growth Stalls and Focus Shifts to 'Meaningful Universal Connectivity' to Drive Global Development," International Telecommunications Union, September 22, 2019, <https://www.itu.int/en/mediacentre/Pages/2019-PR16.aspx>.
26. GSMA Connected Women, *The Mobile Gender Gap Report 2019*, 2019, <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/02/GSMA-The-Mobile-Gender-Gap-Report-2019.pdf>.
27. GSMA Intelligence, *The Mobile Economy: Sub-Saharan Africa 2019*, 2019, <https://www.gsmaintelligence.com/research/?file=36b5ca079193fa82332d09063d3595b5&download>.
28. World Bank, "Enabling Digital Development: Digital Finance," in *World Development Report*, 2016, http://documents.worldbank.org/curated/en/896971468194972881/310436360_20160263021313/additional/102725-PUB-Replacement-PUBLIC.pdf.
29. The Canadian Press, "Bank of England's Mark Carney Says Cryptocurrencies Aren't Financial State Risk, but Likely to Be Regulated," *Toronto Star*, April 12, 2018, <https://www.thestar.com/business/2018/04/12/bank-of-englands-mark-carney-says-cryptocurrencies-arent-financial-state-risk-but-likely-to-be-regulated.html>.
30. P. Inman, "Mark Carney: Dollar Is Too Dominant and Could Be Replaced by Digital Currency," *The Guardian*, August 23, 2019, <https://www.theguardian.com/business/2019/aug/23/mark-carney-dollar-dominant-replaced-digital-currency>.