

# Mobilizing Technology for Development

An Assessment of World Bank  
Group Preparedness



**IEG**  
INDEPENDENT  
EVALUATION GROUP

**WORLD BANK GROUP**  
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# Abbreviations

AI	artificial intelligence
ASA	advisory services and analytics
CASA	Central Asia–South Asia
CHIP	Connect, Harness, Innovate, Protect
CoP	Community of Practice
COVID-19	coronavirus
CPF	Country Partnership Framework
CV	curriculum vitae
DE4A	Digital Economy for Africa
DEC	Development Economics
DECDG	Development Economics, Development Data Group
DTT	disruptive and transformative technologies
FY	fiscal year
GEMS	Geo-Enabling for Monitoring and Supervision
ICT	information and communication technology
IDA	International Development Association
ID4D	Identification for Development
IEG	Independent Evaluation Group
IFC	International Finance Corporation
IT	information technology
ITS	Information and Technology Solutions
MDDT	Mainstreaming Digital and Disruptive Technologies

MNA	Middle East and North Africa
SCD	Systematic Country Diagnostic
TMT	Telecoms, Media, and Technology

*All dollar amounts are US dollars unless otherwise indicated.*

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# Overview

## Highlights

The World Bank Group adopted a new approach to disruptive and transformative technologies (DTT) in 2018, later merging it with the 2019 DTT Mainstreaming approach, and further developing it through the 2020 Mainstreaming Digital and Disruptive Technologies Initiative. Given that the Mainstreaming approach is relatively new, this evaluation focuses on the Bank Group's preparedness for providing DTT support rather than on the outcomes of that support. It establishes a baseline and highlights specific areas for the Bank Group's attention, action, and monitoring that can help it enhance the effectiveness of its future DTT support.

The main findings of this evaluation are twofold: (i) the Bank Group's traditional areas of strength, such as its support for global public goods, honest broker role, production of quality advisory services and analytics, and ability to mobilize International Development Association resources and trust funds, have enabled its support for DTT for development; (ii) given the accelerating pace and complexity of technological change, the Bank Group is not yet sufficiently well prepared to help clients harness the opportunities and mitigate the risks posed by DTT, despite some areas of strength.

The Bank Group will need to seize opportunities where DTT offer the potential to achieve the twin goals more effectively or efficiently and play a particular role in addressing DTT risks. Support for DTT by the Bank Group may not be relevant in all contexts and at all times.

# Context for World Bank Group Engagement

Disruptive and transformative technologies (DTT) have far-reaching implications for development. Traditional development models are being disrupted by the accelerating pace of technological change and the convergence of multiple technologies, among other things. What distinguishes the current DTT revolution from past technological revolutions (such as the industrial revolution) is the explosion of data. In 2015 and 2016 alone, more data were created than in all previous years combined.

Recognizing the implications of DTT for development, the World Bank Group adopted a new approach to DTT in 2018, later merging it with its 2019 DTT Mainstreaming approach and further developing it through the 2020 Mainstreaming Digital and Disruptive Technologies Initiative. The Bank Group's approach encompasses five DTT corporate priorities (country diagnostics, agile regulations, digital connectivity, digital government, and skills and capabilities for the new economy and the role of education), the Bali Fintech Agenda (financial technology and digital entrepreneurship), and sectoral and regional programs (for example, Digital Economy for Africa Moonshot/Accelerate and MNA [Middle East and North Africa] Tech). The Bank Group aims to help clients harness the opportunities and mitigate the risks of DTT to accelerate progress toward achieving the twin goals of ending extreme poverty and boosting shared prosperity. The transition to a mainstreaming approach from earlier discrete areas of support marked a significant increase in the Bank Group's ambition regarding DTT. Accordingly, the Bank Group's definition of DTT broadened beyond digital technologies to include other technologies (such as robotics, artificial intelligence, the internet of things, biotechnology, 3D printing, solar power, and batteries) and the analog complements (such as policies, institutions, and skills). It also extended beyond the "application" of technology to development challenges (for example, using computers in the classroom) to the "response" to technology (for example, imparting socioemotional skills to equip people for future jobs that machines will not be able to perform). The Bank Group's definition of DTT, however, lacks operational clarity and does not sufficiently distinguish among *digital*, *disruptive*, and *transformative*. To date, much of the Bank Group's focus has been on digital technologies.

The Bank Group is implementing an array of DTT initiatives across all Regions and is engaged in innovative DTT initiatives, such as Development Data Partnership (formerly Data Collaboratives), Development Marketplace to Address Gender-Based Violence (in which the International Finance Corporation [IFC] also participated), Disruptive Technologies for Development Trust Fund, Geo-Enabling for Monitoring and Supervision, Geospatial Operations Support Team, the Information and Technology Solutions (ITS) Technology and Innovation Lab, Lighting Global, Social Development Data Lab, and IFC's TechEmerge and ScaleX. Adding significance and urgency to the Bank Group's DTT support are the DTT-related commitments for the 19th Replenishment of the International Development Association (IDA), the capital increase package, and opportunities offered by DTT to respond to the disruptions caused by the coronavirus (COVID-19).

## Framework for Analysis

This evaluation sought to answer the following question: How well prepared is the Bank Group to help clients harness the opportunities and mitigate the risks posed by DTT?

The evaluation covered the World Bank and IFC (henceforth collectively referred to as the Bank Group) and drew on multiple sources. A literature review encompassing the organizational effectiveness literature and relevant Independent Evaluation Group evaluations identified the main preparedness dimensions for DTT support, which included dimensions of organizational ability and organizational willingness. Organizational ability was examined in terms of staff skills and mindsets, as well as internal processes and procedures. Organizational willingness was examined in terms of institutional culture and incentives. The relevance, timeliness, and effectiveness of the Bank Group's support for DTT will also be influenced by how well that support is tailored to and affected by country context factors.

Thematic reviews were conducted of the five DTT corporate priorities, the Bali Fintech Agenda, and selected sectoral and regional programs. Semi-structured interviews of 105 Bank Group staff probed their experiences with DTT and were analyzed using NVivo, a qualitative data analysis software. Interviews of 57 external stakeholders were also conducted.

## Bank Group Preparedness

Given the accelerating pace and complexity of technological change, the answer to the evaluation question is that the Bank Group is not yet sufficiently well prepared to help clients harness the opportunities and mitigate the risks posed by DTT, despite some areas of strength.

### Where the Bank Group Is Best Prepared

The Bank Group's traditional areas of strength are also where it is best prepared to support DTT.

### Supporting Global Public Goods

The Bank Group has a solid reputation for supporting global public goods, which increasingly use DTT. For example, the Global Facility for Disaster Reduction and Recovery supports the use of DTT through open-source technology and geospatial data-sharing platforms to help people worldwide access risk information. Furthermore, the Bank Group is recognized for its expertise in development data and is helping Bank Group operations take advantage of the DTT-enabled opportunities for data production, analysis, and use through initiatives such as the Development Data Partnership (formerly Data Collaboratives), Geo-Enabling for Monitoring and Supervision, and the Geospatial Operations Support Team.

### Serving As an Honest Broker

The Bank Group's reputation as an honest broker stems from its record of neutrality in dealing with public and private sector technology initiatives, its access to worldwide academic and commercial technological knowledge, and its prominent role in advising and negotiating with governments. By leveraging its honest broker role and adopting a problem-driven approach, the Bank Group—in its support for the Identification for Development program—has aimed to address the long-standing challenges of targeting the right beneficiaries and delivering multiple services through interoperable systems.

## Undertaking Quality Analytical Work

The Bank Group's ability to offer quality advisory services and analytics (ASA) has also enabled it to support DTT. ASA has equipped the Bank Group with actionable recommendations to support clients in putting their digital economies on a robust footing.

## Providing Trust Funds and IDA Resources

The Bank Group's ability to mobilize trust funds and IDA grants and credits has bolstered its DTT support. For example, in Benin, IDA financing (for the West Africa Regional Communications Infrastructure Program—Benin project) enabled the development of a competitive telecoms sector with open access to all providers of communications infrastructure. Furthermore, trust funds have supported World Bank task teams in piloting projects and gaining a better understanding of constraints. For example, in the Kenya Industry and Entrepreneurship Project, the use of trust funds to launch a competition among local start-up companies enabled the World Bank team to better understand issues such as local intellectual property rights.

## Where the Bank Group Is Less Prepared

### Links between the Bank Group's DTT Support and the Twin Goals

Links between the Bank Group's DTT support and the twin goals were assessed for two of the five Bank Group DTT corporate priorities, noting that all DTT corporate priorities are relevant for achieving the twin goals. The two selected DTT corporate priorities were (i) country diagnostics that help chart the new drivers of growth and (ii) skills and capabilities for the new economy and the role of education.

**Country diagnostics.** The Bank Group has given increased attention to the digital economy in a few recent country diagnostics and strategies. Of those referred to in the 2019 World Bank Mainstreaming Paper (World Bank 2019h), this evaluation found that discussion of the digital economy in the Morocco and Senegal Country Partnership Frameworks was informed by

findings in their respective Systematic Country Diagnostics. However, this was not always the case. There has also been insufficient effort in the Systematic Country Diagnostics in linking the support for digital technologies to the twin goals (for example, when identifying key constraints). Furthermore, the newly introduced digital economy diagnostics have not adequately considered the broader development agenda and the twin goals. Contributing reasons include (i) limited participation by relevant Global Practices in the preparation of digital economy diagnostics and (ii) insufficient disaggregated data, such as internet usage by income group.

### Skills and capabilities for the new economy and the role of education.

In light of the changing nature of work, the *World Development Report 2019* notes that lack of education is likely to be one of the strongest mechanisms for transmitting inequalities from one generation to the next (World Bank 2019m). It emphasized the need to invest early in twenty-first century skills to be prepared for the changing nature of work. DTT have a critical role to play in education, to equip workers and children for the job market of the future. For instance, the application of DTT can improve the delivery of education. In addition, the education system can facilitate a response to DTT by fostering the twenty-first century skills necessary for the job market of the future. The Bank Group's top corporate initiatives in education—the Human Capital Project and the Learning Poverty initiative—spotlight “necessary” skills such as literacy and numeracy. The Bank Group has an opportunity to move the narrative forward from necessary skills to include twenty-first century “sufficient” skills, such as advanced cognitive skills, digital literacy, and socioemotional skills, in particular a growth mindset or the ability to “learn to learn” and adapt. Necessary and sufficient skills are critical for ensuring that a workforce is well prepared for the future labor market.

### Staff Skills and Mindsets for DTT Support

The Bank Group's fiscal year (FY)20–22 Human Resources Strategy presents key insights about staffing issues that confront the Bank Group, acknowledging the need to build the expertise required to cope with rapid technological change. This evaluation found that the Bank Group has yet to (i) identify the DTT-relevant skills that it needs; (ii) ensure that its information systems and databases contain the necessary information on its current DTT-relevant

skills; and (iii) take action to fill any gaps. In interviews conducted for this evaluation, Bank Group staff noted that the number of existing staff with DTT-relevant skills was insufficient to meet client demand. In the education sector, staff referred to the EdTech Fellows program as an initiative that could provide lessons, positive and negative, on how to address skills shortages in DTT for development. Interviewees also noted the need to raise awareness and better leverage existing staff expertise and resources across different sectors. Furthermore, they reported that a mindset for continuous learning and adaptation would help enhance the effectiveness of the Bank Group's DTT support. IFC interviewees perceived that DTT expertise was fragmented after the realignment of Telecoms, Media, and Technology teams, which initially diluted IFC's ability to maintain thought leadership in DTT. The more recent absorption of the Telecoms, Media, and Technology group into the Infrastructure group and the Fintech team into the Financial Institutions Group, and the realignment and hiring of staff in the Disruptive Technologies and Funds group, in addition to the respective industries' Upstream units (including specialists in artificial intelligence and machine learning), have sought to address gaps in DTT-relevant thought leadership and expertise. However, it is too early to assess the effectiveness of these measures.

## Internal Processes and Procedures for DTT Support

**Collaboration.** The need for collaboration is underlined by the wide-ranging nature of DTT projects that cut across sectors and often involve both public and private institutions. The Independent Evaluation Group found examples of effective collaboration in providing DTT support in the Bank Group, for example the Development Data Partnership (formerly Data Collaboratives), the Digital Central Asia–South Asia program, Geo-Enabling for Monitoring and Supervision, and Identification for Development. However, interviewees from across Global Practices perceived that collaboration is insufficient among the different Global Practices, with instances of competition for task team leadership. The lack of collaboration between the World Bank and IFC is also an issue, because successful DTT-related outcomes require knowledge and inputs from both the public and private sectors.

**Procurement (World Bank only).** Procurement was a major constraint to the smooth implementation of DTT-related projects in the eyes of most World Bank interviewees. There is currently only fragmented guidance for complex technology projects, specifically on their associated risks (such as vendor lock-in, lack of interoperability of systems, potential loss of data ownership and lack of data privacy, limitations in technology-specific legislation and regulation, and mismatch between business processes and the requirements of the particular technology). The World Bank’s procurement systems have provided some flexibility for complex technology projects, for example the use of framework agreements for software maintenance or servicing. However, interviewees noted that there was insufficient guidance on how to apply the available flexibility in different situations, suggesting the need for such guidance. Reluctance to use the available flexibility may also result from misaligned incentives that encourage risk aversion.

## Institutional Culture and Incentives for Risk Taking and Innovation

Harnessing DTT for development often demands innovation, which by definition is without precedent and inevitably risky. However, interviewees reported that DTT were treated in the same way as other sectors or themes, despite their fluid and fast-moving nature, and that relevant staff were not encouraged to keep at the cutting edge of technological advances and DTT trends. Furthermore, the levers at the disposal of the Bank Group (such as leadership signaling, questions asked in operational review meetings, and the performance management system) were not yet being effectively used to facilitate informed risk taking, learning from successes and failures, or innovation for DTT for development. Interviewees saw the operational review process as constraining innovation and creative solutions, given the general support for continuing on a familiar path rather than for breaking new ground. Interviewees reported that legal, procurement, and external relations departments often asked for precedents. Finally, risk taking—however informed and calculated—means failing at least some of the time, and interviewees said they would benefit from knowing how failure would be treated by Bank Group management.

# Moving Forward: Directions of Travel

The Independent Evaluation Group presents—for the Bank Group’s consideration—possible directions of travel, including examples for each, that can help the Bank Group move forward in strengthening its preparedness for DTT for development.

## 1. Building on the Bank Group’s Existing Strengths

**Mining DTT-generated development data to create even greater social value.** DTT enable development data to be collected and analyzed cost-effectively, with high frequency, and at fine levels of granularity. This granularity can allow for personalizing services, for example tailoring learning to individual students in poor areas whose performance may be lagging and thus potentially helping reduce high dropout rates. Both the Bank Group’s *World Development Report 2021* on data (World Bank 2021), as well as the recently established Data Governance body and its supporting Data Governance Steering Committee, could boost the World Bank’s ability to support development data. Optimizing the use of public and private data—both those made available by DTT and those that can be analyzed more effectively by using DTT—can help the Bank Group become a data-driven organization.

**Leveraging the honest broker role by advising clients, especially on DTT risks.** The Bank Group’s perceived neutrality positions it well to advise on DTT risks such as income inequality, data privacy, data security, and cyber-surveillance. Attention to DTT risk is particularly important in Identification for Development systems, which are especially vulnerable to inadvertent data spills or willful misuse. Addressing DTT risks and adhering to the do no harm principle may require the Bank Group to navigate sensitive ethical and political issues and advise clients on them. Where it lacks the necessary technical expertise to help clients mitigate DTT risks, the Bank Group could use its convening power to bring together relevant experts.

**Using explicit corporate metrics to track the implementation of the Bank Group’s DTT Mainstreaming approach.** Explicit metrics—defined at the corporate level—can help track progress and enable timely course correc-

tions, thereby facilitating learning and the successful implementation of the Mainstreaming approach.

## 2. Enhancing Bank Group Capabilities That Are Not Yet Its Forte

### Addressing gender-differential impacts of DTT, beginning with ASA work.

Although the Bank Group’s strategic documents recognize the gender-differential impacts of DTT, a review of gender and DTT for this evaluation found that just 7 percent of World Bank ASA in the information and communication technology (ICT) sector (ICT sector percentage weight of 50 percent or more) approved during FY15–18 were gender-relevant ASAs, a particular concern since it is in ASA that new opportunities to address the gender-differential impacts of DTT can be explored. (Gender-relevant ASAs were identified using a keyword search and desk review. Appendix C provides methodological details.) Furthermore, although 76 percent of the 51 World Bank ICT projects (ICT sector percentage weight of 50 percent or more) approved during FY15–19 had one or more gender-relevant flags, 37 percent had all three gender-relevant flags.

## 3. Developing New Strengths

**Fostering a growth mindset in the Bank Group.** Given the uncertainties created by technological change, the Bank Group could enhance its preparedness for DTT by ensuring a growth mindset that promotes continuous learning and adaptation among its staff. This would entail encouraging staff to recognize—and learn from—mistakes without fear of repercussion.

**Systematically applying foresight and anticipation to inform and guide the Bank Group’s support of DTT for development.** Given the accelerating pace of technological change and the associated uncertainty, foresight and anticipation have a particular role in DTT for development. Foresight and anticipation can enable the Bank Group to regroup and take on challenges in real time and thrive even in markedly changed circumstances. The Bank Group’s Country Partnership Framework is already applying foresight and anticipation to outline the Bank Group’s country strategy four to six years out. More specif-

ically for DTT, the recent exploration of foresight and anticipation by the Bank Group's Technology and Innovation Lab is a promising step.

## Recommendations

This evaluation makes three recommendations:

**Recommendation 1: Where DTT offer opportunities to make progress on the twin goals more effectively or efficiently, ensure that the Bank Group avails itself of those opportunities and addresses, in particular, the risks posed by DTT.** This will entail, for example:

- » Systematically identifying in both country diagnostics and digital economy diagnostics the opportunities and risks posed by DTT for achieving the twin goals;
- » Consistently asking in operational review meetings (from Concept Note to approval and implementation stages) whether and how the use of DTT in operations can bring (or is bringing) effectiveness and efficiency gains in addressing the twin goals; and
- » Strengthening cross-sectoral linkages and synergies between DTT and sectoral issues, including through enhanced collaboration across Global Practices and between the World Bank and IFC, particularly where different units support technological solutions with the same client.

Where appropriate, a complement to country and digital economy diagnostics could be a review of ongoing and pipeline projects for DTT opportunities, such as the one undertaken recently in Vietnam.

**Recommendation 2: Build a Bank Group workforce with the skills required to harness DTT opportunities and mitigate DTT risks by identifying DTT-relevant skills, determining gaps in these skills, and filling these gaps.** This will entail:

- » New recruitment of staff or consultants to fill specific skills gaps, retraining of existing staff, outsourcing, secondments, external partnerships, or a combination of these;

- » Ensuring a more efficient use of the skills of available specialized staff and a better bridging of technology expertise with that of sector specialists and task team leaders; and
- » Supporting a growth mindset for continuous learning as noted in the Bank Group’s FY20–22 Human Resources Strategy.

**Recommendation 3 (World Bank only): Improve the effectiveness and efficiency of World Bank procurement for complex technology projects.**

This will entail, for example:

- » Strengthening procurement guidance for staff and borrowers, for early-stage project scoping as well as subsequent capacity development, on the identification, prioritization, and mitigation of the risks associated with complex technology projects. The guidance could cover: availing of existing flexibilities for complex technology projects, such as two-stage bidding; monitoring the extent to which World Bank staff teams adopt these flexibilities; and institutionalizing arrangements for technology project management.
- » Ensuring that teams benefit from effective and efficient innovation while protecting the World Bank and the borrower from procurement-related reputational risks.
- » Preparing a roster of the world’s leading experts on the procurement of complex technology projects and encouraging market consultations on technical requirements in the preparation of bidding documents.

# World Bank Group Management Response

Management welcomes the Independent Evaluation Group (IEG) report, *Mobilizing Technology for Development: An Assessment of World Bank Group Preparedness*. This topic is key for the Bank Group, given its relevance to both the 19th Replenishment of the International Development Association (IDA) policy commitments and the International Bank for Reconstruction and Development–International Finance Corporation (IFC) capital package commitments. It has become even more timely in the context of the coronavirus pandemic (COVID-19). Management would like to thank IEG for undertaking this evaluation and consulting with management throughout the process.

## World Bank Management Response

Management is pleased with the report’s appreciation of the World Bank’s solid reputation in supporting global public goods using disruptive and transformative technologies (DTT). The report recognizes that the Bank Group plays an important role as (i) an honest broker in dealing with public and private sector technology initiatives, (ii) a provider of robust advisory services and analytics on DTT, and (iii) a catalyzer for concessional funding in support of DTT initiatives. Management will build on these strengths and develop new ones by incorporating lessons learned from the IEG evaluation. Given the relative novelty of the mainstreaming approach (articulated in 2019), many improvement opportunities identified by the report (such as the/a proposed shift of the human capital and learning narrative[s?]) from “necessary” skills of literacy and numeracy to include 21st century “sufficient” skills of digital literacy to meet the demands of the future labor market) are subject to ongoing efforts by management across a variety of fronts. Most of these efforts are still at early stages. For example, the FY21 Education Global Practice (GP) pipeline includes 42 projects that support the development of digital skills (both in basic and higher education) for teachers, principals, and learners.

Management believes that the report's conclusion that the World Bank's focus is largely limited to digital technologies (as opposed to DTT), is prompted by an incomplete account of World Bank initiatives. The report appears to focus mostly on activities undertaken by the Digital Development Group, the Data Development Group, and the Education GP. Many more groups across the World Bank spearhead initiatives that are relevant to this agenda. There is significant analytical and operational work across various Practice Groups (particularly in the Sustainable Development Practice Group) on data platforms, disruptive technologies, and technology innovations. Many of the more recently developed action plans, studies, and initiatives on DTTs provide a better sense of World Bank preparedness for supporting clients on DTTs.

Management recognizes that even more systematic internal collaboration is needed, given the wide-ranging nature of DTT projects that cut across sectors and involve both public and private institutions. The report describes several initiatives, notably Identification for Development (ID4D), that have generated collaboration across GPs. Notwithstanding these initiatives, management recognizes that the multisectoral dimensions of the agenda and the rapid evolution of the sector require further efforts. Therefore, it recently established the Digital and Disruptive Technologies Initiative, housed within the Digital Development GP, as an avenue to link different GP initiatives on DTT. This initiative will continue to mainstream digital and DTT solutions across sectors and work across the GPs to scale up digital and DTT applications in World Bank projects.

Management does not share the negative assessment of the Digital Economy for Africa Initiative (DE4A) yet recognizes room for improvement. DE4A fosters significant levels of collaboration across GPs and IFC. Each diagnostic is conducted with other GPs and IFC to avoid fragmentation of the analysis. Any digital economy assessment is done by a team of task team leaders from Finance, Competitiveness, and Innovation; Governance; Digital Development; Education; and IFC. The DE4A initiative and analytics by the offices of the Middle East and North Africa and Africa Region chief economists demonstrated the benefits of increased digital technology adoption and the links to both the twin goals and the Jobs and Economic Transformation agenda. The preparation of DE4A assessments (over 20 countries in Africa in FY19 and FY20) enhanced Bank Group readiness to respond to client

demand. The initiative evolved after an adaptive process and will continue to do so by carefully examining the assessment of this report. The methodology was updated and tighter links between diagnostics and implementation enabled based on the initial experiences of preparation of DE4A diagnostics.

Management agrees with the report's first recommendation, namely, to seize the opportunities brought by DTT to make progress on the twin goals and will continue doing so wherever relevant. This is fully in line with the 19<sup>th</sup> Replenishment of IDA policy commitments and the International Bank for Reconstruction and Development-IFC capital package commitments, which conceive the adoption of inclusive transformative technologies as promising means to achieve the twin goals. In this regard, management welcomes the report's recognition that "more recent country diagnostics and strategies have increased attention to the digital economy." Management emphasizes that the World Bank's country engagement model is based on a principle of sovereign selectivity; hence, there should be no expectation that all World Bank client countries will systematically seek to assess or exploit opportunities for DTT. In this context, when it is justified by the congruence of client demand, policy dialogue and analysis, and the World Bank's comparative advantage, management will continue making efforts to ensure appropriate diagnostics are conducted and a line of sight to the twin goals explicitly established. It is precisely for this purpose that the Bank Group recently endeavored to improve the digital economy country diagnostic methodology (version 2). Although the diagnostic is focused on the foundations of the digital economy, it recognizes that additional deep dives may be needed to further study specific areas of development, especially for key socioeconomic sectors. The diagnostic intends to provide actionable recommendations to governments and stakeholders on priority areas of development, with a mix of possible policy reforms and financing needs, and guidance on potential areas to achieve the twin goals.

Management will continue developing a robust pipeline of analytical activities and cross-sectoral initiatives with the intention of implementing the report's recommendations. The knowledge and analytical pipeline is designed to provide practical tools for World Bank staff to harness opportunities and mitigate risks of DTT through the World Bank portfolio, enhance the skills of World Bank staff, and provide guidance on procurement for DTT. These

activities also support knowledge creation and technical assistance to World Bank clients. Many of these activities are managed jointly across different Practice Groups and between the World Bank and IFC.<sup>1</sup> The World Bank will leverage this broad spectrum of efforts by continuing to work closely with public and private partners and by enhancing its capacity through externally funded activities (for example, Digital Development Partnership).

Management also agrees with the report’s second recommendation, to build a workforce with the skills required to harness DTT opportunities and address DTT risks. Management welcomes the report’s acknowledgment of World Bank measures to strengthen the skills of staff working on digital development. As the report indicates, the World Bank has facilitated several staff to get online university degrees on artificial intelligence (AI), cybersecurity, 5G, and regulation. There is a large amount of learning on DTT in the Open Learning Campus. Disruptive Technologies is the main “Cross-Cutting” learning theme for staff learning and includes a package of learning on blockchain, AI, and internet of things. The Digital Development GP is sponsoring a wide range of training on mobile technologies, cybersecurity, and connectivity, among other topics. Information technology services has a Technology and Innovation Lab whose goal is to “serve as a catalyst, enabler and accelerator for WBG [World Bank Group] staff to learn about and build expertise around emerging technologies’ potential to support the WBG development agenda.” It also has an active staff learning program (Learn2Innovate) that partners with GPs for learning sessions on topics such as blockchain, AI, and other technologies with potential applications to the World Bank’s work. The Sustainable Development Practice Group has a robust learning program on the use of technologies for remote preparation and supervision for projects under its Remote Supervision and Preparation of Projects initiative. Additionally, the World Bank benefits from secondments of DTT experts from donor countries and the private sector. These initiatives demonstrate a growing commitment of time and resources, which will be sustained by management.

Finally, management agrees with the report’s third recommendation, to improve the procurement of complex technology projects, and believes that continuing to invest in client capacity and staff knowledge and skills is the most promising pathway to the outcome desired. Management appreciates

the report’s illustrative example that upgrading the current guidance on complex procurement could be one solution to that end, but it must be complemented with other efforts to be sufficiently consequential. A fundamental issue with complex information and communication technology and DTT projects is that client countries’ institutional strength has a material impact on the course of procurement. Countries with strong control institutions typically discourage the use of innovative procurement methods or award processes that are more flexible. This offers strong disincentives for government decision makers to innovate, reinforcing behaviors to stick to a more objective, price-based award decision to avoid criticism by controllers. This needs to be more systematically factored in during project preparation and negotiations with clients, including through better reflection in procurement documents for specific contracts. As mentioned in the report, these issues are discussed in analytical reports being prepared by management under the GovTech Global Partnership (“GovTech Procurement Strategy”) and by the Procurement Global Unit (“Disruptive Technologies in Public Procurement”). Management will ensure that as these reports are finalized, appropriate lessons are compiled and guidance revised, as warranted, to inform staff and client capacity-building efforts.<sup>2</sup>

## International Finance Corporation Management Response

DTTs play an increasingly critical role in a country’s economic growth and are fundamentally transforming how we and our clients do business. COVID-19 has only accelerated this trend of DTT and digitalization, impacting a wide spectrum—from productivity, scale, and the very nature of work, to financial inclusion, access to health and education, global value chains, and food security. Given the potential of DTT to help our client countries achieve their goals and the novel risk considerations digital development presents, this evaluation on the Bank Group preparedness is timely and important. IFC management welcomes this evaluation and would like to acknowledge the IEG team’s effort in evaluating this important subject.

IFC has been strategically planning and implementing various organizational changes to position itself to more effectively integrate DTT across all aspects

of its business, from strategy formulation, investment, advisory, upstream, and diagnostics, to thought leadership. IFC management is critically aware that all industries need to understand the new reality that rapid innovation is changing business economics and therefore business models. It will change the constituency of IFC's clients and how they operate their business. With this awareness, IFC management implemented two major organizational changes—IFC sector team realignment and upstream business establishment. In retrospect, these changes coincided with the time when the data collection and Bank Group interviews were being conducted for this evaluation.

In FY19–20, IFC management restructured its organization around DTT to better reflect the critical role of technology in development and strategically position IFC toward tapping into these investment themes. First, digital infrastructure, including telecommunications technology and services (TMT), moved to the Infrastructure Department. Second, financial technology (fintech), which has been investing in early-stage digitally-enabled payments and financial services since 2007, moved to the Financial Institutions Group Department (FIG). This was done in recognition of the impact fintech was having on financial services and the need to more closely integrate learnings from the technology portfolio into our work across the spectrum of financial services. Third, what we now call the Disruptive Technologies and Funds Department (CDF) was established as an Industry Department focused on the intersection of technology, manufacturing, agriculture, climate, and infrastructure that combines both funds and direct investments in early-stage businesses. CDF now integrates closely with our mainstream teams in FIG; Manufacturing, Agribusiness, and Services; and the Infrastructure Department to inform and share knowledge on disruptive technology trends while also cooperating through investment joint ventures on all aspects of investment decisions, knowledge transfer, and other cross-sectoral upstream and advisory initiatives in the space. In addition, IFC upstream business, which was launched in FY19, was further formalized in FY20 with the creation of the Global and Industry Upstream units. This aimed to better position IFC to support IFC 3.0's vision toward market creation with a strong focus on harnessing the opportunities enabled by DTT and the digital agenda.

Although the report notes the reorganization, IFC management appreciates that the timing of the IEG evaluation may not have fully captured the

extent of the above realignment and enhancement efforts in DTT across its investment, upstream, advisory and thought leadership businesses, some of which were in their infancies of establishment. It is notable to highlight that these activities have translated into increased capacity and expertise in DTT across IFC and enhanced collaboration within the Bank Group and private sector partners. Noting that it was too early to assess the effectiveness of its realignment and enhancement measures, IFC management would welcome IEG's further assessment at a later time on the outcome of the efforts to strengthen its readiness to help clients harness the opportunities offered by DTT and mitigate the risks posed by them. In the interim, we highlight key enhancements that have taken place primarily since the above realignment, complementing the report.

### Investments in Disruptive Technologies, Fintech, and Digital Infrastructure.

As a leading emerging markets Venture Capital (VC) investor in disruptive technologies and fintech, IFC has invested over \$1.5 billion in the VC and fintech asset class, building a portfolio that has approximately 120 direct investments in tech-enabled startups alongside over 50 limited partnership investments in early-stage VC funds across the emerging markets. IFC has developed unique expertise to support innovative business models leveraging technology in this space and built a portfolio with a diverse set of DTT solutions—from financial inclusion, access to high quality health care and education, to climate innovation—demonstrating a capacity for continuous learning and adaptation. In addition, we have provided financing or equity of \$5 billion in digital infrastructure and the broader TMT space over the past 10 years, including mobilization.<sup>3</sup> IFC is championing the pioneering of a transactional approach in several areas, such as electric vehicles, cold chain logistics, virtualization of infrastructure, digital twins of utilities operations, Cloud Platform as a Service, and green data centers. As of January 2020, IFC has 60 active portfolio projects and 66 pipeline projects with a digital component, totaling \$3.1 billion in investments. The development impact and financial returns of these investments have been quite attractive. Below are some examples:

- » **Keeping supply chains afloat:** E-logistics platform TradeDepot in Nigeria connected small businesses directly with suppliers and supplied food to informal

retailers during lockdown, helping over 40,000 microretailers stay in business. The business is now expanding to other countries, including Ghana.<sup>4</sup>

- » **Expanding access to education:** Ed-tech companies connect students to teachers without ever having to set foot in a classroom. The example mentioned in the report, Byju's in India, has enabled over 900,000 students in India to expand their education.<sup>5</sup>
- » **Extending reach of health care:** Health-tech companies like 1mg in India are providing critical medicines through e-pharmacy services to remote villages and connecting patients to doctors through e-consultation, for which demand has spiked over 440 percent during the pandemic. The data advantage has led this business to become the leader in AI powered diagnostics through e-medicine in remote parts of the country.<sup>6</sup>
- » **Financial inclusion:** Fintech companies like Fawry, which started the first and largest electronic payment platform in Egypt and now serves over 30 million customers, bring convenient, lower cost payment systems to a country where as recently as 2014, 94 percent of all transactions were cash.<sup>7</sup>

**Advisory services.** In addition to IFC's investments in DTT, IFC has developed extensive advisory capacity, including in-house expertise, to support the digital agenda. With over 220 advisory projects with digital or technology components that were launched since FY13 and currently in pipeline, IFC's advisory assistance cuts across the themes of digital financial services, digital infrastructure, digital entrepreneurship, and digital skills. One such example, the Digital Gender-Ethiopia Program with Gebeya, provides critical software development skills to female students and helps build robust digital economies and competitive markets. IFC has particularly taken a programmatic approach with initiatives, such as IFC Startup Catalyst,<sup>8</sup> ScaleX,<sup>9</sup> and TechEmerge,<sup>10</sup> to support the development of digital entrepreneurship. Similarly, we have taken a programmatic approach to underpin technology adoption in innovative climate programs, such as in Scaling Solar, Lighting Global, and EDGE.<sup>11</sup> In the financial sector, IFC has supported financial institutions in adopting digital channels to drive efficiencies and expand the reach of financial services, and in leveraging data and technology for credit underwriting, risk management and transformation of back-end processes. The continuous evolution and sophistication of IFC's product offering in this

space demonstrates a capacity to adapt and evolve. Some important collaborations with donors have supported this work, such as the Partnership for Financial Inclusion supported by the Mastercard Foundation and the United Kingdom-funded Harnessing Innovation for Financial Inclusion program, a partnership across World Bank Finance, Competitiveness, and Innovation; the Consultive Group to Assist the Poor; and IFC.

**Upstream.** IFC management highlights that its investment and advisory support in DTT are well complemented by the upstream business, Diagnostics and Analytics, Thought Leadership, and other activities to maximize our development contribution. Since its establishment, IFC's Upstream efforts have been strengthening the institution's ability to bring together different teams from IFC and the World Bank to catalyze highly effective financial solutions for development and to impact policy and regulatory interventions. Eight TMT related Upstream Platforms, including Energy Service Companies for Telecom Anchor Clients; Satellite, Rural Communications, Cloud and Data Services, and internet of things, have been launched, targeting investment opportunities in cutting-edge market segments. To facilitate private investments, each of these platforms is scheduled to publish a study for public use and undertake some analytics that can be used by IFC and the World Bank teams.

**Country diagnostics and analytics.** Complementing the work on Systematic Country Diagnostics (SCDs), IFC, together with the World Bank, produces Country Private Sector Diagnostics (CPSDs) since 2017 as a core tool to deliver on IFC 3.0. The diagnostics then feed into two country-level strategy documents, the IFC Country Strategy and/or the Bank Group overall Country Partnership Framework. In this regard, many CPSDs have included the assessment of the DTT and sectors at their nexus and have led to World Bank-IFC joint interventions in the digital sector, for instance, in Kyrgyz and Madagascar. Furthermore, a separate Disruptive Technology and Digital Economy guidance note is being created to help each CPSD consider DTT opportunities and risks in the country. In terms of Analytics, IFC is enhancing its internal capabilities by undertaking a series of DTT analytical research pieces, such as ones stated above related to the eight Upstream Platforms and a Sector Deep Dive on digital infrastructure. Recent analytics also studied a model to assess the economic impact of reforms in the telecom sector; a benchmarking tool to assess areas of regulatory interventions

to enable digital entrepreneurship; and the impact of digital connectivity on entrepreneurship and innovation in Africa.

**Thought leadership.** We further emphasize the role of IFC in exercising Thought Leadership in the DTT space. IFC has published a rich collection of related Thought Leadership pieces. For instance, recent pieces discuss the potential long-term impact of the COVID-19 pandemic on digitalization and adoption of disruptive technologies and a framework for anticipating the potential impact of COVID-19 on digital connectivity. Other pieces have contributed research and ideas to the application of AI in emerging markets (including its ethical uses), the Africa internet economy, sector trends and investment opportunities offered by DTT, and digital connectivity through infrastructure sharing.

**Bank Group collaboration.** IFC management appreciates an extensive section dedicated to this topic in the report and agrees that the World Bank and IFC could play separate but complementary and highly coordinated roles to enhance DTT projects. As identified in the assessment, there has been increasing effective collaboration examples in the DTT and related sectors, including the “Digital Economy for Africa (DE4A)” initiative to digitally enable Africa by 2030 and the “Identification for Development (ID4D)” initiative highlighted in box 4.2 of the report; CDF Senior Director is a core member of the latter’s Senior Directors’ Group. IFC has contributed to 30 DE4A diagnostics by sharing its private sector perspectives and knowledge centrally collected and coordinated from across IFC by CDF. IFC continues to work with the World Bank as the Digital Economy Initiatives roll out in Central America (DE4CA) and South Asia (DE4SA) in alignment with the Cascade approach. For successful DTT-related outcomes, IFC teams are on the same page with the report that contributions from both public and private sectors are needed. We will further seek opportunities to improve the collaboration with the World Bank teams.

**Gender.** Although the report’s gender analysis focused on the World Bank, IFC management welcomes an increased focus on the cross-section of gender and technology. IFC’s Gender and Economic Inclusion Group hosts a team focused exclusively on inclusive technology. Since FY19, IFC has invested over \$140 million in projects with a gender focus across funds

and disruptive technologies and launched multiple advisory initiatives and market leading research reports. Examples include the first-ever research on women and ride-hailing, globally and in Sri Lanka, and the first investigation into emerging women-only solutions, which informed the development and rollout of increasingly prevalent solutions in the industry. The organization has also taken a lead convening the sector to develop and mainstream best practice in inclusive tech; for instance, the Digital2Equal initiative, the program cited in the report, has brought together 17 companies in the platform economy to close gender gaps.

The pandemic has exacerbated the need for more investments in this space and a burgeoning of new and innovative technologies that require our support. Digital transformation is key to ensuring that countries are well poised for the future. To that end in particular, the digital gender divide must be bridged by focusing closely on the role women play in this space—either as entrepreneurs, clients, or end users and decision makers. We also cannot afford to lose generations of youth due to lack of access to technologies for education or growth. IFC management will prioritize its efforts in this area, keeping in mind the report’s findings and two recommendations given to IFC.

## Response to Recommendations

**Recommendation 1.** Given the above progress, IFC management is aligned with the thrust of the first recommendation. As noted, IFC has implemented two major organizational changes that we believe would yield a more effective and efficient response to opportunities to make progress on the development challenges, such as the twin goals, and to address risks posed by the adoption of DTT. The organizational changes have enabled us to establish CDF as a focal point to promote increased collaboration within the Bank Group and with external partners. In parallel, IFC management would like to further highlight the extensive work that we are doing in the Sector Deep Dives, CPSDs, Country Strategies (including the business plans) as described above. This host of institutionalized instruments offers opportunities for IFC to design, implement and invest in DTT private sector solutions in our countries of operations. Senior Managers within our organization are taking the lead in aligning the DTT agenda, ensuring that it is sufficiently incorporated

into the direction of our investment, advisory services, and upstream work programs. We will continue our efforts to leverage the changes implemented.

**Recommendation 2.** With respect to the second recommendation, IFC management acknowledges that DTT is a rapidly changing area where we need more skilled staff. Steps were being taken to address those gaps as this evaluation was being carried out. The aforementioned restructuring has prioritized challenges related to skills in recognition of areas mentioned in the IEG report, and it has paved the way to enhance skillsets. Given the fast-changing pace and evolution of the DTT space, it would be very challenging and virtually impossible to keep expertise embedded in the institution. However, IFC has the core foundations of in-house DTT generalists who understand technology and its impact on our business embedded within our industry groups. IFC management commits to continue assessing its DTT skills and expertise needs as markets and technologies evolve, and leverage external consultants to ensure that our work in the space remains relevant to our clients and impactful in our markets and operations. IFC management will also continue to strengthen the expertise required to run IT for the Corporation. As also briefly introduced in the report, rapid response training has been offered in key areas, such as privacy, cybersecurity, AI, regulatory reform, digital finance, and technology investing. We are actively collaborating with the information technology services Technology and Innovation Lab to enhance staff understanding of new technology opportunities and are also proactively seeding new activities, such as cybersecurity appraisal, with staff who have previously acquired expertise in these areas. Several units have worked programmatically to upskill their own staff to better support IFC's technology activities.

We agree that harnessing DTT for development demands innovation and involves controlled risk taking. Spaces for such innovations exist in IFC with early-stage fintech and VC investment activities, including recently developed venture ecosystem building programs to further embrace the DTT agenda, such as Startup Catalyst, Scale X, and TechEmerge, as mentioned above. IFC will continue its effort to enhance risk taking and innovative, growth mindsets.

<sup>1</sup> The most prominent example is the forthcoming *World Development Report 2021: Data for Better Lives*, which will highlight ways in which the Bank Group can both harness opportunities and mitigate risks in the area of data. Other forthcoming knowledge products cover topics such as disruptive technologies and sustainable development, the converging technology revolution and human capital: potential and implications for South Asia, clean energy, artificial intelligence, cloud and data storage, cybersecurity, digital gender gap, resilience, blue economy, remote monitoring, digital health, ed-tech, citizen engagement, digital government, financial technology, digital solutions to COVID-19 vaccine distribution, and digital ID. The Bank Group will also continue to support cross-sectoral initiatives such as Identification for Development (ID4D), Digital Economy for Africa (DE4A), and the Digital Central Asia-South Asia program. Disruptive and transformative technology (DTT) is also an important element of the World Bank's response strategy to the COVID-19 crisis, as DTT offers the opportunity for governments, individuals, and businesses to cope with the pandemic, ensure business continuity, prevent service interruptions, and ensure social distancing. The Bank Group is committed to building back better and working with clients and partners to exploit innovative approaches that can speed progress in fighting the pandemic and transform crisis into opportunity.

<sup>2</sup> ID4D was also a leader in ICT procurement. ID4D developed, in collaboration with World Bank procurement specialists, a Procurement Guide and Checklist for Digital Identification Systems. This helped countries (i) understand the risks of vendor and technology lock-in, and possible mitigation measures; (ii) develop a robust procurement strategy for ID systems based on key design decisions; and (iii) develop effective requests for proposals (RFPs) aligned with short and long term goals and sufficiently elaborate business and technical requirements for the ID system.

<sup>3</sup> The TMT investment is expected to further grow based on its quadrupled pipeline over the past 12 months and increased sector presence.

<sup>4</sup> A co-investment. \$4.5 million committed in FY20.

<sup>5</sup> IFC/R2016-0247. \$7.8 million committed in FY16.

<sup>6</sup> IFC/R2019-0174. \$12.5 million committed in FY19

<sup>7</sup> IFC/R2012-0346. \$6 million committed in FY13.

<sup>8</sup> A facility through which IFC makes equity and quasi-equity investments in a number of commercially-oriented Incubators, Accelerators, Seed Funds, and similar vehicles and structures, across emerging markets.

<sup>9</sup> An incentive program to increase equity funding access for women entrepreneurs.

<sup>10</sup> A program seeking to pilot technology projects uniquely tailored to local needs, supported by a global network of industry advisors.

<sup>11</sup> <https://edgebuildings.com/> Scaling Solar and Lighting Global are described in appendix K of the report.

# Report to the Board from the Committee on Development Effectiveness

The Committee on Development Effectiveness met to consider the Independent Evaluation Group evaluation entitled *Mobilizing Technology for Development: An Assessment of World Bank Group Preparedness* and the draft management response.

The committee welcomed the timely report and commended the Independent Evaluation Group for the quality and focus of the evaluation. Members were appreciative of management's broad agreement with the evaluation recommendations and its recognition that while it had begun implementing the recommendations, there was scope for enhancing an already substantial effort undertaken by the World Bank Group to improve staff skills and capacities, expand the use of procurement flexibilities, and establish incentive for risk taking and innovation with regard to disruptive and transformational technologies (DTT). They stressed the crucial role that digital technology has played in helping governments, businesses, and people cope with the coronavirus pandemic (COVID-19) as well as the role it can have in driving growth in the economic recovery from the pandemic. In this regard, members acknowledged the far-reaching and important implications DTT can have in (i) improving lives and fostering growth and development and (ii) accelerating progress toward reducing poverty, promoting shared prosperity, and achieving the Sustainable Development Goals. Noting that the Bank Group was a trusted partner and was well positioned to be effective in helping clients integrate innovative solutions to development challenges using transformative technologies, they underscored the importance of assisting client countries in assessing and mitigating risks associated with these technologies. Management reiterated its agreement with all three recommendations with the caveat that (i) the investment in requisite staff skills needed to be viewed while taking into consideration tradeoffs among competing staffing needs in the context of a flat real budget and (ii) the fact that, while

procurement flexibility existed in the Bank Group, clients were often reluctant to use it given their internal control environments.

Members agreed with the Independent Evaluation Group's assessment that the Bank Group needed to demonstrate organizational nimbleness to constantly anticipate, innovate, and adapt as part of its mission to achieve the twin goals and thus urged management to continue to build partnerships and develop knowledge and skills for staff to equip them to better support clients in harnessing DTT. They noted the link between discussions on knowledge management, learning, and outcome orientation and the need for stronger collaboration within the Bank Group, a strengthened incentive system, and the creation of a workplace culture of willingness to (i) adapt to an ever-changing working environment, (ii) learn from failure, and (iii) take informed risks to allow innovation. They stressed the need for the International Finance Corporation to play a larger role and for the Bank Group to enhance cross-institutional collaboration.

Members expressed concern about the lack of reliable data on DTT operations and the impact this may have on monitoring these operations or fostering innovation. In response, management highlighted a sharp increase in Bank Group financing of DTT from \$69 million in FY19 to a projected \$1.5 billion in FY21 and \$2 billion in FY22. Members appreciated the proposed diagnostic work and pipeline of analytical activities and organizational changes to better reflect the role of technology in development. They encouraged management to speed up implementation where there was capacity to deliver technology deployment and bridge the digital gap within and across countries. Acknowledging the impact that technology can have in traditional firms, members encouraged the Bank Group to think about how to make technology inclusive, equitable, and an enabler of job creation.



# 1 | Background and Context

## Highlights

The World Bank Group adopted a new approach to disruptive and transformative technologies (DTT) in 2018, later merging it with the 2019 DTT Mainstreaming approach, and further developing it through the 2020 Mainstreaming Digital and Disruptive Technologies Initiative. The transition to a mainstreaming approach from earlier discrete areas of support marked a significant increase in the Bank Group's ambition regarding DTT.

DTT-related commitments pertaining to the 19th Replenishment of the International Development Association and the capital increase package, as well as the opportunities DTT offer to respond to the disruptions caused by the coronavirus (COVID-19), add significance and urgency to the Bank Group's DTT work.

Consistent with the Bank Group's use of the term, this evaluation adopts a broad interpretation of DTT and covers (i) support to digital technologies (such as the internet, mobile phones, smart-phones, and Wi-Fi), and to other technologies (such as robotics, artificial intelligence, the internet of things, nanotechnology and biotechnology, 3D printing, batteries, drones, solar panels, and self-driving vehicles); (ii) enabling policies, institutions, and skills; (iii) relevant lending and nonlending operations in all sectors (not just in the digital development and information and communication technology sectors); and (iv) both the "application" of technology (for example, using computers in the classroom) and the "response" to technology (for example, imparting socioemotional skills to equip people for future jobs that machines will not be able to perform).

The world is experiencing rapid technological change with far-reaching implications for development. The accelerating pace of technology diffusion, the convergence of multiple technologies, and the emergence of global platforms are disrupting traditional development models (Pauwels 2019; World Bank 2019h). Disruptive and transformative technologies (DTT) are already reshaping the way goods and services are produced and consumed and have profound implications for the functioning and dynamics of the global economy (Dobbs, Manyika, and Woetzel 2015; Manyika and others 2017). At the national level, traditional development paths may no longer be viable, at least in some developing countries, as they run out of low-skilled manufacturing opportunities sooner and at much lower levels of income compared with the experience of early industrializers (Hallward-Driemeier and Nayyar 2018).<sup>1</sup>

DTT offer new opportunities for reducing poverty and promoting shared prosperity. Business as usual is unlikely to get countries to the Sustainable Development Goals by 2030 (Kramer, Agarwal, and Srinivas 2019). DTT can improve people's lives and transform economies, governments, and societies, for example by enhancing connectivity among markets around the globe, opening up new jobs and sources of livelihood, and improving the delivery of social and financial services (Brynjolfsson and McAfee 2014; Dobbs, Manyika, and Woetzel 2015; Manyika and others 2017). The United Nations Secretary General's High-Level Panel on Digital Cooperation (2018) advanced proposals to strengthen cooperation on digital issues among governments, the private sector, civil society, international organizations, academia, the technical community, and other relevant stakeholders.<sup>2</sup> Box 1.1 presents examples of development opportunities created by DTT.

## Box 1.1. Disruptive and Transformative Technologies Have Created New Development Opportunities

### Low-Tech Development Solutions: Smartphones and Audio

- » The World Bank's Geo-Enabling for Monitoring and Supervision is a client-focused capacity-building program that enables local stakeholders to leverage simple and low-cost digital tools ("pocket science") for customized monitoring and evaluation, remote supervision, real-time risk monitoring, and portfolio mapping for coordination across projects and partners (World Bank 2019k).
- » Amplio Network, a nonprofit organization, is sharing knowledge with the world's hardest-to-reach communities through an easy-to-use "talking book" audio device designed to provide information to people who cannot read and who live in places where there is no electricity or network and collect their feedback (Brodnig and others 2020).

### High-Tech Development Solutions: Artificial Intelligence

- » Deep-learning algorithms are diagnosing retinopathy in patients living in rural India, where there is a shortage of ophthalmologists.
- » Portable genomic sequencers are bringing the lab to the jungle, allowing for the diagnosis of the Ebola virus in "hot zones."
- » Open Innovation Lab in Shenzhen, China, young inventors have designed wearable devices that rely on image recognition to help farmers detect diseases on crops.
- » Companies like Zipline are using artificial intelligence in autonomous drones to deliver critical medical supplies, such as vaccines, to rural hospitals in Africa.
- » The United Nations Children's Fund is collaborating with the Massachusetts Institute of Technology on deep-learning expertise to simulate images of major global cities in ruin to promote empathy and connection with the suffering of those who have experienced bombing, loss, and war.
- » The combined optimization of biometric, genomic, behavioral, and physical systems data is giving rise to "affective computing"—algorithms that can successfully analyze, nudge, and communicate with people. Affectiva, an affective computing company, has developed Peppy Pals, a series of educational apps that teach children about social and emotional intelligence by learning from situations in an online world.

*(continued)*

### Box 1.1. Disruptive and Transformative Technologies Have Created New Development Opportunities (cont.)

- » The *World Development Report 2019* notes that Ant Financial (of the Alibaba Group) makes loans using a “3-1-0” online lending model based on big data and artificial intelligence, which involves a three-minute application process and a one-second processing time, with zero manual interventions (Pauwels 2019; World Bank 2019m).
- » India’s Mobile-Based Surveillance Quest Using Information Technology is a smartphone-based platform that enables better outbreak monitoring and real-time responses for malaria (Pathways for Prosperity Commission 2019a, 2019b).

Source: Independent Evaluation Group.

DTT also pose risks for reducing poverty and promoting shared prosperity. At the macro level, new technologies may reduce job opportunities for the less skilled. According to recent studies by the International Monetary Fund (2018) and the Organisation for Economic Co-operation and Development (2018), technological change likely has contributed to widening inequalities in earnings, shifting labor demand toward high-skilled occupations, and promoting automation over routine work. Concentrating market power in the hands of digital and data service providers, for example, may give rise to new policy and regulatory issues concerning monopolies, competition, accountability, data privacy, and taxation (Lee 2018). Furthermore, deep-learning systems (systems inspired by the structure and function of the brain or neural networks) can drastically intensify the nature and scope of cyberespionage and cyberattacks within smart cities (Pauwels 2019) and enable cybersurveillance by governments for political ends. New technologies also bring the risk that a few powerful states will shape the digital future for everyone else (Pathways for Prosperity Commission 2019a). Box 1.2 highlights the risks posed by DTT.

## Box 1.2. Risks Posed by Disruptive and Transformative Technologies

- » **Skills and income inequality.** The *World Development Report 2016* pointed out that with the changing nature of jobs, those who can acquire additional skills will switch to better-paid nonroutine occupations; they will be the winners, and others will be the losers (World Bank 2016e). Automation poses a greater risk for women as they tend to be overrepresented in routine work, although this depends on their level of education (Brussevich and others 2018).
- » **Platform firms and income inequality.** By operating in regulatory gray zones, platform firms can avoid taxes, creating huge wealth for a few with data collected from the many, thereby creating monopolistic tendencies and exacerbating income inequality.
- » **Algorithms as “weapons of math destruction.”** Algorithms can be opaque, unregulated, and uncontestable and may reinforce bias: “If a poor student cannot get a loan because a lending model deems him too risky (by virtue of his zip code), he’s then cut off from the kind of education that could pull him out of poverty, and a vicious spiral ensues” (O’Neil 2016).
- » **“Internet of bodies,” data privacy, and cybercrime.** Most corporate artificial intelligence platforms already have access to individuals’ online behaviors, relationships, health, and emotional states. But soon enough, these platforms will acquire baseline information about people’s vital signs, organs, and genomes. The “internet of bodies” and simpler digital technologies all have implications for data privacy and cybercrime (Pauwels 2019; USAID 2018b).
- » **Internet’s environmental footprint.** Observers are increasingly concerned about the internet’s environmental footprint. They point out, for example, that mining of blockchain-based digital currencies is hugely energy intensive (see Randeep Sudan comments in Stanley 2017). Concerns about the effects of electromagnetic radiation on people, plants, bee colonies, and frogs around the globe were presented at the United Nations 2018 Forum on Science, Technology and Innovation (Singer 2014).
- » **Social media, aspirations, envy, and violence.** The *World Development Report 2019* notes that technology, in particular social media, affects the perception of rising inequality in many countries and heightens feelings of alienation and envy, which can in turn incite discontent, conflict, and violence (World Bank 2019m). Women and girls are more likely to experience threats of intimidation, harassment, defamation, violence, surveillance, or some combination of these than are men and boys (World Wide Web Foundation 2015).

The explosion of data distinguishes the current DTT revolution from past technological revolutions (such as the industrial revolution): In 2015 and 2016 alone, more data were created than in all previous years combined (Goldberg 2020). The recent explosion of data has largely come from private sources, such as mobile phones, electronic transactions, and satellites. Such data are collected cost-effectively, with higher frequency, and at fine levels of granularity, typically by private sector actors. Such data has fueled innovation in the private sector. According to the *World Development Report 2021*, development policy has traditionally relied on public data collected by governments, which offer better coverage of the population of interest but can also be costly, collected infrequently, and lack granularity (World Bank 2021).

The World Bank Group has adopted a new approach to DTT in recognition of the opportunities DTT offer and the risks they pose. The Bank Group outlined its new approach to DTT in a 2018 Development Committee paper, “Disruptive Technologies and the World Bank Group: Creating Opportunities—Mitigating Risks” (World Bank 2018b), which was subsequently merged with the 2019 Development Committee paper “Mainstreaming the Approach to Disruptive and Transformative Technologies at the World Bank Group” (henceforth called the “Mainstreaming paper”; World Bank 2019h). The new Mainstreaming approach aims to harness the opportunities and mitigate the risks posed by DTT to accelerate progress toward the Sustainable Development Goals and the Bank Group’s twin goals of ending extreme poverty and boosting shared prosperity.<sup>3</sup> The Mainstreaming paper was accompanied by the Bali Fintech Agenda, jointly prepared by the World Bank and the International Monetary Fund (World Bank 2018g). More recently, the Bank Group’s 2020 Program Document for the Mainstreaming Digital and Disruptive Technologies (MDDT) Initiative further develops the Mainstreaming approach, mainly outlining the institutional arrangements for DTT (a Network, a Technical Working Group, and a Secretariat) within the Bank Group (World Bank 2020d).

The Mainstreaming approach to DTT builds on previous technology strategies, while implying a significant increase in ambition. The Bank Group’s past technology engagements encompassed support to science and technology, research and development, and innovation. Specific technology strategies have existed since 2002, mainly for the information and communication technology (ICT) sector. In transitioning from discrete areas of support to mainstream-

ing, the Bank Group's Mainstreaming approach extends beyond ICT to other sectors and covers the enabling policies, institutions, and skills. Appendix H provides details of the evolution of the Bank Group's approach to DTT.

The Independent Evaluation Group (IEG) definition of DTT is consistent with that of the Bank Group.<sup>4</sup> Box 1.3 provides further detail of the definition, and box 1.4 lists the various programs and units engaged in DTT work across the Bank Group.

### Box 1.3. World Bank Group and Independent Evaluation Group Definition of Disruptive and Transformative Technologies

First, the World Bank Group's Mainstreaming paper notes that disruptive and transformative technologies (DTT) are "often based on digital technologies and products," but that these "go far beyond connectivity and the potential of the internet" (World Bank 2019h, 4). Second, beyond digital technologies, DTT include technologies such as robotics, artificial intelligence, the internet of things, nanotechnology and biotechnology, 3D printing, batteries, drones, solar panels, and self-driving vehicles. Third, DTT also include technology's analog complements (such as enabling policies, institutions, and skills; World Bank 2016e). Fourth, in addition to the "application" of technology to development (for example, using computers in the classroom), DTT also cover the "response" to technology, as in the case of education (for example, imparting socioemotional skills to equip people for future jobs that machines will not be able to perform). Fifth, the Bank Group recognizes the close relationship between DTT and innovation. Innovation both impacts and influences DTT and results from them: innovation has created DTT solutions such as online education and telemedicine, and DTT have led to innovations such as artificial intelligence and the internet of things. Furthermore, the links between DTT and innovation are recognized in the East Asia and Pacific Region's DTT framework called Connect, Harness, Innovate, Protect (CHIP). Sixth, DTT cover both new uses of old technologies (for example, mobile phones) and new technologies and business models. Seventh, the magnitude of the "step change" in disruptive technologies or the degree of transformation that defines transformative technologies were not specified in the Bank Group's Mainstreaming paper, leaving the terms *disruptive* and *transformative* ambiguous. Finally, the Mainstreaming paper presented digital connectivity and agile regulation as two of the Bank Group's five DTT corporate priorities, implying that the Bank Group conceives of DTT as an umbrella term that subsumes digital technologies.

Source: Document reviews by the Independent Evaluation Group.

## Box 1.4. Disruptive and Transformative Technologies Programs and Units in the World Bank Group

Key World Bank programs and units focused on disruptive and transformative technologies (DTT) include the following: • AgObservatory • Artificial Intelligence Lab • Blockchain Lab • Cybersecurity workstream • Data Collaboratives • Data Council • Data Development Group • Data Lab • DECAT • DEC Data • Digital Technology for Development • Disruptive KIDS (Knowledge, Information and Data Services Helpdesk) • EdTech • Fintech Coordination Group • Gender Innovation Lab • Geo-Enabling Initiative for Monitoring and Supervision • Geospatial Operations Support Team • GovTech • Information and Technology Solutions (ITS) Geospatial • ITS Innovation Lab • Open Learning Campus • Social Development Data Lab • Sustainable Development Remote Preparation and Supervision Group • Technology and Innovation Lab • World Bank Data Catalog • workstream on data and privacy (piloted in Middle East and North Africa and in Europe and Central Asia) • regional DTT initiatives such as Digital Central Asia–South Asia (Europe and Central Asia), Connect, Harness, Innovate, Protect—CHIP (East Asia and Pacific), Digital Economy Country Diagnostics and advisory services and analytics (South Asia), Digital Economy for Africa Moonshot/Accelerate (Africa), Digital Transformation Program (Latin America and the Caribbean), and MNA Tech (Middle East and North Africa) • leveraging digital technologies to support the Jobs and Economic Transformation Agenda in International Development Association countries • several DTT activities linked to COVID-19 • data programs and units covering data collection; data storage, management, and sharing; data analysis; and work and industry.

Key International Finance Corporation units and programs focused on DTT include the following: • the Telecoms, Media, and Technology group within the Infrastructure and Natural Resources Department • the Fintech team in the Financial Institutions Group • the Disruptive Technology and Funds Group • TechEmerge • ScaleX.

In addition, the International Finance Corporation has created Upstream units for each of the industry departments, including those focusing on DTT, to support market creation initiatives and pipeline development for the International Finance Corporation.

*Source:* World Bank Group data (not evaluated by the Independent Evaluation Group).

The Bank Group has adopted the build, boost, and broker value proposition to mainstream its DTT approach and is pursuing five corporate priorities, the Bali Fintech Agenda priorities, and sectoral and regional programs. The five corporate priorities are (i) country diagnostics, (ii) agile regulations, (iii) digital connectivity, (iv) digital government, and (v) skills and capabilities for the new economy and the role of education. Following the Bali Fintech Agenda, the Bank Group is also supporting fintech and digital entrepreneurship. Sectoral and regional programs to support the Mainstreaming approach include the Digital Economy for Africa (DE4A) Moonshot/Accelerate and MNA (Middle East and North Africa Tech). Appendix B provides details.

The Bank Group is implementing an array of DTT initiatives across all Regions. These initiatives include lending and nonlending work: (i) in Europe and Central Asia, through the Digital Central Asia–South Asia (CASA) optical fiber cable program; (ii) in East Asia and Pacific, through the Connect, Harness, Innovate, Protect (CHIP) framework; (iii) in South Asia, through the Digital Economy Country Diagnostics; (iv) in Africa, through the DE4A Moonshot/Accelerate with the African Union; (v) in Latin America and the Caribbean, through the Digital Transformation Program with the Organization of Eastern Caribbean States countries; and (vi) in Middle East and North Africa, through MNA Tech, focused on the digital transformation of governments and economies as well as regional integration. Bank Group initiatives also include a significant pipeline of country and regional initiatives.

The Bank Group is also engaged in innovative DTT initiatives. Innovative DTT initiatives include the Development Data Partnership (formerly Data Collaboratives), Development Marketplace to Address Gender-Based Violence (in which the International Finance Corporation [IFC] also participated), Disruptive Technologies for Development Trust Fund, Geo-Enabling for Monitoring and Supervision (GEMS), Geospatial Operations Support Team, Information and Technology Solutions (ITS) Technology and Innovation Lab, Lighting Global (including Lighting Africa and Lighting Asia), and Social Development Data Lab. IFC's innovative DTT initiatives include TechEmerge and ScaleX (which increases access to funding for women entrepreneurs).

DTT-related commitments in the 19th Replenishment of the International Development Association (IDA) and the capital increase commitments add

significance to the Bank Group’s DTT support. These include several policy commitments relating to technology that the Bank Group will need to meet, for example boosting broadband penetration and supporting digital financial services and entrepreneurship; supporting women’s digital skills and resulting access to higher productivity jobs and increased access to ICT services; and supporting the use of field-appropriate digital tools and analysis in fragile and conflict-affected situations (IDA 2020). Regarding the capital increase commitments, Bank Group management has undertaken to further leverage smart technology solutions (World Bank 2018e).

More recently, by bringing to light the importance of social distancing and travel restrictions to contain pandemic diseases, the coronavirus (COVID-19) has elevated the urgency of location-neutral solutions, for which DTT are especially suited. The Organisation for Economic Co-operation and Development and the World Bank are collaborating to use DTT (for example, mobile apps, artificial intelligence [AI], and big data) to aid the COVID-19 response around the world. The four directly health-related uses of DTT are (i) outbreak spread monitoring; (ii) prevention and symptom tracking; (iii) contact tracing; and (iv) enforcement of containment measures (Amaral, Vranic, and Lal Das 2020). Beyond these uses, the Bank Group has experience in other areas—such as fintech,<sup>5</sup> digital IDs; technology-enabled operations in fragility, conflict, and violence contexts; and distance education and online learning—that can also be deployed to respond to COVID-19. IFC has also sought to leverage its venture capital portfolio in HealthTech and EdTech. The Bank Group has provided \$160 billion in financing through June 2021, including to support digital foundations and applications (appendix J). This significant commitment for the pandemic response demonstrates the Bank Group’s preparedness to quickly address exogenous shocks. An IEG evaluation is planned to assess the quality and relevance of the response.

## About This Evaluation

This evaluation sought to answer the following question: How well prepared is the Bank Group to help clients harness the opportunities and mitigate the risks posed by DTT? Key aspects of the evaluation’s focus and scope are as follows. First, the focus of the evaluation is on the preparedness of the Bank

Group to provide DTT support rather than on measuring the effectiveness or outcomes of that support—a deliberate choice given the newness of the Bank Group’s Mainstreaming approach. Second, the term DTT refers to DTT for development. Third, the evaluation does not include an assessment of the Bank Group’s own use of computer hardware and software or of its own information technology (IT) systems. Fourth, the evaluation’s analysis of education, procurement, and gender covers the World Bank only. Fifth, in this report the term Bank Group is used to cover the World Bank and IFC only, not the Multilateral Investment Guarantee Agency or the International Centre for Settlement of Investment Disputes, which are not part of this evaluation.

IEG identified the preparedness dimensions from the organizational effectiveness literature and relevant IEG evaluations and organized these into two groupings: (i) organizational ability (in terms of staff skills and mindsets, as well as internal processes and procedures such as collaboration and procurement) and (ii) organizational willingness (in terms of institutional culture and incentives for risk taking and innovation).<sup>6, 7, 8</sup>

These dimensions were examined to assess how well prepared the Bank Group was to help clients harness the opportunities and mitigate the risks posed by DTT. The overall framework for analysis informing this evaluation was that preparedness dimensions relating to organizational ability and organizational willingness influence the Bank Group’s support to DTT with regard to both its five DTT corporate priorities, fintech, and digital entrepreneurship, as well as its sectoral and regional programs. The relevance, timeliness, and effectiveness of the Bank Group’s support for DTT will also be influenced by how well the Bank Group support for DTT is tailored to and affected by country context factors. Figure A.1 in appendix A illustrates this.

Specifically for IFC, the assessment of DTT preparedness focused mainly on the corporate priorities of the Mainstreaming paper and interventions from relevant key departments. These key departments were as follows: for the digital connectivity corporate priority, the Telecoms, Media, and Technology (TMT) group in the Infrastructure and Natural Resources Department; for fintech and digital entrepreneurship, the Financial Institutions Group and the Disruptive Technology and Funds group. Activities of other units in IFC’s

evolving organizational structure, notably the Upstream units created in fiscal year (FY)20, were too recent to be the subject of this evaluation.

The main evaluation instruments included the following:

- » A review of the organizational effectiveness literature and existing IEG evaluations.
- » Thematic reviews covering the Bank Group’s DTT corporate priorities, fin-tech, and digital entrepreneurship as well as selected sectoral and regional programs.
- » A review of project documents and advisory services and analytics (ASA) relating to all DTT-related World Bank projects in education and gender over the past five years.
- » A review of tech-informed Systematic Country Diagnostics (SCDs) and Country Partnership Frameworks (CPFs).
- » Document reviews of lending and ASA for a purposive sample (selected based on interviews and database analysis) of digital connectivity in the World Bank and IFC (investment projects), electronic government services (especially those pertaining to social protection and digital ID), fintech (in both the World Bank and IFC), and digital entrepreneurship operations.
- » A review of the Bank Group’s information systems and databases—in collaboration with the Development Economics, Development Data Group (DECDG)—to assess the staff skills for DTT work.
- » Semistructured interviews covering 105 Bank Group staff, including World Bank and IFC team leaders and investment officers, as well as 57 external stakeholders, including World Bank and IFC clients. The 105 Bank Group staff interviews were analyzed using NVivo, qualitative data analysis computer software. Details of the NVivo analysis and other methodological aspects are presented in appendix A.

## Evaluation Challenges

There is no official Bank Group operational list that identifies DTT-related projects and ASA (except for Digital Development or ICT projects and ASA).

Consequently, IEG identified DTT-related projects and ASA in consultation with the relevant Global Practices. It did so for two Bank Group priorities that have strong significance for the twin goals: education (the Bank Group's DTT corporate priority skills and capabilities for the new economy) and Gender (Bank Group Global Theme).

Given that the Bank Group's Mainstreaming approach for DTT is relatively new, this evaluation focused on Bank Group preparedness for providing DTT support rather than on the outcomes of that support. Most of the Bank Group's DTT-related operations identified in the Development Committee papers are incipient or incomplete, meaning that effectiveness or outcomes, which are among the key measures of Bank Group preparedness, do not yet exist (World Bank 2018b; World Bank 2019h). In this context, the evaluation establishes a baseline and highlights specific areas for the Bank Group's attention, action, and monitoring that can help it enhance the effectiveness of its future DTT support to clients.

Bank Group data related to DTT preparedness (such as on staff skills and mindsets, collaboration, procurement, and institutional culture and incentives) are, at best, incomplete, requiring IEG to draw on staff interviews. Staff interviews had the advantage of helping assess not only how things looked on paper but also how staff perceived these things in practice. If staff perceived that the Bank Group had not equipped them (for example, with appropriate skills and knowledge), empowered them (for example, through adequate decision-making power to innovate and chart a new course), or supported them (for example, when they took risks and failed), it would not matter how good things looked on paper. NVivo was used to systematically analyze staff views.

## Report Organization

Chapter 2 focuses on key Bank Group enablers of DTT support and the links between this support and the twin goals. The links with the twin goals were assessed for two select Bank Group DTT corporate priorities: (i) country diagnostics that help chart the new drivers of growth (corporate priority 1) and (ii) skills and capabilities for the new economy (corporate priority 5) and the role of education. Chapters 3 and 4 examine the Bank Group's preparedness

regarding organizational ability in terms of staff skills and mindsets (chapter 3), and internal processes and procedures, specifically collaboration and procurement (chapter 4). Chapter 5 assesses the Bank Group’s preparedness regarding organizational willingness in terms of the Bank Group’s institutional culture and incentives for risk taking and innovation. Chapter 6 presents—for the Bank Group’s consideration—directions of travel that can help the Bank Group move forward in strengthening its preparedness for DTT for development. Chapter 7 concludes and makes three recommendations.

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<sup>1</sup> The *World Development Report 2013* pointed out how India and other countries set up high-tech enclaves despite poor overall information communication technology infrastructure (World Bank 2012b, 55–57). See also Peralta-Alva and Roitman (2018) for a comparison.

<sup>2</sup> The United Nations High-Level Panel on Digital Cooperation, chaired by Jack Ma and Melinda Gates, makes five sets of recommendations: (i) build an inclusive digital economy and society; (ii) develop human and institutional capacity; (iii) protect human rights and human agency; (iv) promote digital trust, security, and stability; and (v) foster global digital cooperation.

<sup>3</sup> The twin goals are (i) end extreme poverty: reduce the percentage of people living on less than \$1.25 a day to 3 percent by 2030; and (ii) promote shared prosperity: improve the living standards of the bottom 40 percent of the population in every country.

<sup>4</sup> Although the 2019 Development Committee mainstreaming paper used the term *disruptive and transformative technologies (DTT)* (which the Independent Evaluation Group [IEG] uses), the World Bank Group's most recent mainstreaming paper uses the term *DDT (digital and disruptive technologies)* with no change in the definition.

<sup>5</sup> The scale of mobile money continues to grow, with more than 900 million accounts in 90 countries and \$1.3 billion in daily transactions (Pasti 2018).

<sup>6</sup> For organizational effectiveness literature, see, for example, Burnard and Bhamra 2011; Christensen 1997; Christensen, Anthony, and Roth 2004; Christensen and Overdorf 2000; Christensen and Raynor 2003; Hatum and Pettigrew 2006; Sheffi 2007.

<sup>7</sup> For relevant IEG evaluations, see, for example, World Bank 2011a, 2012a, 2013, 2015a, 2016b.

<sup>8</sup> The detailed list of preparedness dimensions based on the literature is (i) organizational ability: knowledge and thought leadership; staff skills; resources; organizational structure, roles, processes and decision-making that allow for flexibility; agility, knowledge sharing and learning, and cross-sectoral coordination and collaboration; ability to identify, adapt, and deploy knowledge on technological developments; and partnerships, global networks, and positioning relative to other actors; and (ii) organizational willingness: leadership, culture, and incentives for innovation, and risk appetite and informed risk taking.



# 2 | Harnessing DTT for Development: Key Bank Group Enablers and Links with the Twin Goals

## Highlights

### ||| Key World Bank Group Enablers

||| The Bank Group's traditional areas of strength, such as its support for global public goods including development data, honest broker role, production of quality advisory services and analytics, and ability to mobilize International Development Association resources and trust funds, have enabled its support for disruptive and transformative technologies for development.

### ||| Links between Two Bank Group Disruptive and Transformative Technology Corporate Priorities and the Twin Goals

### ||| Country Diagnostics

||| The Bank Group has given increased attention to digital economy issues in a few recent country diagnostics and strategies. However, the Country Partnership Frameworks are not always informed by the digital economy findings in the Systematic Country Diagnostics, and there has also been insufficient effort in the latter in linking the support for digital technologies to the broader development agenda, including the twin goals (for example, when identifying key constraints). Furthermore, the newly introduced digital economy diagnostics do not adequately address issues of poverty and inclusion.

## Skills and Capabilities for the New Economy and the Role of Education

The Bank Group's top corporate initiatives in education—the Human Capital Project and the Learning Poverty initiative—spotlight “necessary” skills, such as literacy and numeracy. The Bank Group has an opportunity to move the narrative forward from necessary skills to also include twenty-first century “sufficient” skills, such as advanced cognitive skills, digital literacy, and socioemotional skills, in particular a growth mindset or the ability to “learn to learn” and adapt. Both necessary and sufficient skills are critical for ensuring that a workforce is well prepared for the future labor market.

# Key Enablers of the Bank Group's DTT Support

The Bank Group's comparative strength on global public goods has enabled its DTT support. The Bank Group is well positioned to provide leadership on global public goods using a mix of knowledge, financing, and technology. It has created an important niche in global public goods through which it is increasingly deploying DTT (Kanbur 2017). For example, it is applying digital technologies to regulatory harmonization through the Single Digital Market for East Africa. It is also using new technological tools, such as machine learning, to predict the onset of famines and the displacement of populations resulting from food shortages and conflicts, for example through the Famine Action Mechanism, a global partnership, discussed in appendix G. The Global Facility for Disaster Reduction and Recovery, also a global partnership, enables DTT support through open-source technology and geospatial data-sharing platforms to help people worldwide gain access to risk information.<sup>1</sup> In addition, IFC has aimed to be a thought leader in applying technologies to development, with initiatives such as the Investor Guidelines for Responsible Investing Digital Financial Services (IFC 2017a), reports such as *How Technology Creates Markets* (IFC 2018), recent analytical work on DTT and COVID-19, and several global upstream platforms (which, given their recent introduction, have not been evaluated for this report).

The Bank Group has established an international reputation in development data, a global public good, which has enabled its DTT support. As the demand for development data increases, new technological developments are revolutionizing data production, analysis, and use. For example, the internet of things and social media are contributing to an explosion in the quantity of data for machine learning and AI and are improving the quality of insights from those data. The Bank Group is helping clients take advantage of these opportunities through innovative data initiatives such as the Geospatial Operations Support Team, GEMS, and the Development Data Partnership (formerly Data Collaboratives). Appendix D discusses these initiatives.

The Bank Group is an honest broker between the public and private sectors, which has also enabled its DTT support. The Bank Group's perceived neutral-

ity with regard to technology solutions, reputation among global technology players, access to international technological knowledge (academic and other), and seat at the government table underpin its role as an honest broker (Kanbur 2017; Skoll World Forum 2013). In particular, the Bank Group's honest broker role in providing clients with technical expertise, especially on policy and regulatory matters related to DTT support, was highlighted by Bank Group staff working on digital connectivity and the GovTech Global Initiative who were interviewed for this evaluation. The Bank Group leverages regulatory reform as it expands connectivity infrastructure in lower-income countries and uses its honest broker role to help countries address privacy and other risks. For example, the 2017 Uruguay Improving Service Delivery to Citizens and Businesses through e-Government project aims to address DTT risks by issuing guidelines for data architecture platforms on governance structures, security tools, and data privacy protocols. Interviews with clients for IFC projects in Nicaragua and Turkey indicated that they appreciated IFC's knowledge about technology, long-term focus, and ability to connect clients with the right vendors. However, clients also noted ways in which the Bank Group's honest broker role may be compromised: (i) lengthy bureaucratic processes, especially in procurement (for example, in the Democratic Republic of Congo, Nicaragua, and Turkey); (ii) lack of understanding of local context and technology, as well as poor coordination, especially in fragility, conflict, and violence contexts (for example, the Central African Republic and Somalia); and (iii) staff who are not trained in the latest technology that clients demand (for example, in Vietnam).

In addition, the Bank Group has leveraged its honest broker role to adopt a problem-driven approach in the Identification for Development (ID4D) program. The Bank Group has raised awareness about and encouraged foundational ID systems because they can help more efficiently deliver multiple services (such as social protection and taxation) through interoperable systems, although foundational ID systems carry risks (see the Building on the Bank Group's Existing Strengths section in chapter 6). The ID4D program aims to address long-standing challenges in targeting the right beneficiaries—digitizing unified social registries can reduce the likelihood of inefficiencies in transfers, for example. Appendix I lists key ID4D activities within the World Bank, and box 2.1 presents lessons from the Bank Group's experience with

ID4D on meeting development challenges and the operational needs of clients by taking advantage of the opportunities created by digital solutions.

### Box 2.1. Lessons from Identification for Development

Adoption and scaling of digital technologies work well when the operational needs of clients identified by the Global Practices converge with the opportunities created by digital and technological solutions. This appears to have been achieved, for example, in the case of the World Bank Group's support for the Identification for Development program. The Bank Group has been well positioned to provide its borrowers (where there is demand) with the knowledge and technical assistance to develop or upgrade existing identification systems that can enable delivery of a wide range of social and e-governance services.

Leadership support for Identification for Development has been important. The Jobs and Social Protection Global Practice and the Governance Global Practice were at least partly responsible for developing services that demonstrated the immediate value of improved identification to governments (for safety nets, conditional cash transfers, and government-to-person salaries and pensions), which generated client interest in foundational ID systems. Important for effectiveness has been the flexibility in sequencing the various interventions and services that are digitized and in establishing the links to foundational ID systems when the opportunity and demand arises among country clients.

*Source:* Independent Evaluation Group interviews.

The Bank Group's DTT support has been enabled by its ability to undertake quality ASA. Bank Group interviewees reported that ASA place the Bank Group at the cutting edge for supporting clients with the needed actionable recommendations to ensure a firm footing for their digital economies. For example, ASA for the Kyrgyz Republic in the wake of the 1990s telecom reforms highlighted the need to move from a fragmented to a consolidated regulatory framework and focused on regional connectivity, attracting private investment, and building up the demand side (for example, data centers, digital platforms, identification systems, and cybersecurity). Another example of ASA that can enable World Bank support to DTT is the forthcoming

*ASA The Converging Technology Revolution and Human Capital: Potential and Implications for South Asia* (Bashir and others, forthcoming), which assesses what the World Bank can do to further build, protect, deploy, and empower human capital in the South Asia Region.

The World Bank's ability to mobilize IDA grants, credits, and trust funds has enabled its DTT support. IDA financing facilitated open access to all providers in the Benin telecom sector as part of the West Africa Regional Communications Infrastructure Program, making the sector more competitive and potentially enabling Benin to market excess capacity to neighboring landlocked countries. Trust funds, which offer more flexibility, are a frequent and popular source of financing for DTT, especially for innovative and risky projects, such as those in fintech and digital entrepreneurship. In the Kenya Industry and Entrepreneurship Project, local start-ups were not producing what local industry needed. Using trust funds, the World Bank launched a competition among the start-ups; the winner would work with an agricultural company on concrete solutions. This helped the World Bank team to better understand local issues such as intellectual property rights. Going forward, the World Bank would benefit from monitoring whether its financing for DTT relies too heavily on trust funds, affecting budget predictability or skewing organizational priorities toward what trust fund donors want.

IFC's Disruptive Technologies and Funds department is working with both start-ups and established companies to support innovation in developing countries. IFC seeks to support entrepreneurship ecosystems in developing countries. IFC's investments cover a broad spectrum of disruptive technologies, including fintech (BKash in Bangladesh and GoPay in Indonesia), e-commerce (Twiga in Kenya and TradeDepot across Africa), e-logistics (Kobo360, a digital platform connecting truck drivers with freight companies, initially in Nigeria), and HealthTech (Clinicas Azucar in Mexico). IFC advisory services have similarly supported the DTT agenda. For instance, through its Digital2Equal initiative, in close partnership with the European Commission, IFC has sought to bring together technology companies to promote opportunities for women in expanding access to jobs, assets, and business across online platforms.

# Links between the Bank Group's DTT Support Relating to Two Corporate Priorities and the Twin Goals

These links were assessed for two of the five Bank Group DTT corporate priorities, noting that all DTT corporate priorities are relevant for achieving the twin goals: (i) country diagnostics that help chart the new drivers of growth (corporate priority 1) and (ii) skills and capabilities for the new economy (corporate priority 5) and the role of education.<sup>2</sup> The corporate priority of country diagnostics was selected because it can provide a basis for designing country level (rather than ad hoc) DTT support for addressing the twin goals. The country priority of skills and capabilities for the new economy and the role of education was selected because it is a powerful driver of development, and education is one of the strongest instruments for reducing poverty and inequality.<sup>3</sup>

## Country Diagnostics

Core country diagnostics such as SCDs, the newly introduced digital economy diagnostics, and ASA can help the Bank Group identify potential DTT opportunities and risks. Even when there is no specific client demand for such an identification, these diagnostics can allow the Bank Group to effectively exercise selectivity in programming and to nudge the client toward greater focus on the role DTT can play to further country development agendas and the risks such technologies may present.

The Bank Group has begun to address the digital economy in its country diagnostics (in SCDs) and strategies (in CPFs). The Mainstreaming paper referenced the digital economy discussion in the CPF for Morocco and the SCDs for Poland and Senegal (World Bank 2017b, 2018e, 2019h, 2019i). This evaluation found that both the Morocco and Senegal CPFs addressed the digital economy gaps identified in their respective SCDs. Digital technologies referenced in the Morocco CPF were linked to financial inclusion, social protection, and environmental sustainability of agrifood value chains (World Bank 2019i, 23, 26, 33, 35). The SCD had noted the nascent stage of digital payments in Morocco, highlighting that better access to a diversity of financial

services, including digital payments, would help vulnerable households manage emergencies, build up assets, and invest in health and education (World Bank 2018c, 20). Similarly, the 2020 Senegal CPF, following up on the findings of the SCD, highlighted the transformative role that digital technologies could play in education, digitizing commercial and financial transactions in the agriculture sector, and improving the transparency and efficiency of delivery mechanisms in social protection (World Bank 2020c, 28). The Senegal SCD had noted that many vulnerable people had difficulty accessing basic services and acquiring the necessary skills in school, such as lifelong learning or technical and soft skills (World Bank 2018e, 101). By contrast, the Poland CPF did not mention the digital economy, even though the Poland SCD had identified the digital economy as a key constraint (World Bank 2017b, 6, 77; World Bank 2018d, 29, 30). Although the CPF cannot be expected to address all the constraints identified in the SCD, it would be important to ensure that the CPF's prioritization and selectivity are well justified. IFC, for its part, sees the creation of its Upstream units in FY20 as strengthening the corporation's ability to interact with the World Bank on country diagnostic and strategy work as well as policy and regulatory interventions. IFC has also created the Country Private Sector Diagnostic, which is a tool to assess opportunities for and constraints to private sector led growth.

To date, there has been insufficient discussion in SCDs of the link between digital technologies and the broader development agenda, including the twin goals (for example, when identifying key constraints). The *World Development Report 2019* pointed out that digital technologies have been spreading, but their dividends have not (World Bank 2019m). This evaluation found that the discussion of poverty in the two SCDs mentioned in the Mainstreaming paper (World Bank 2019h)—the Senegal SCD (World Bank 2018e, 23–38) and the Poland SCD (World Bank 2017b)—did not consider the opportunities and risks posed by DTT.

A review of the Bank Group's newly introduced digital economy diagnostics found that none of the sample pilot countries made poverty reduction and inclusion a focus for the digital economy strategy (Hanna 2019).<sup>4</sup> The Bank Group has recently introduced new digital economy diagnostics, which can help assess client capacity for digital solutions. These include the Digital Economy Country Assessment, DE4A Country Diagnostic, and Digital Government Readiness Assessment. The Bank Group's review of these digital economy diagnostics

found that they often failed to explain the persistence of bottlenecks in achieving inclusion. It also highlighted some of the key questions to address in this regard; for example, What explains nonadoption when there is internet coverage? Is low usage the result of high cost, lack of local content, lack of hardware, or missing platforms? When there is usage, how effectively does it contribute to poverty reduction and shared prosperity? Such a focus was clearly absent for the Russian Federation. The Russian Federation Digital Economy Country Assessment pilot did not address the effectiveness of internet usage in contributing to poverty reduction and shared prosperity, even when assessing foundations or use cases like digital government, small and medium enterprises, finance (micro, payments), and innovation and entrepreneurship (Hanna 2019). This was also true for Malaysia and for low-income countries like Senegal (Hanna 2019). Although the DE4A diagnostic focused on the foundations of the digital economy, sectoral issues (in addition to the digital economy foundations) are important for the twin goals. Recently, the Bank Group has undertaken more diagnostic work pertaining to the digital economy.<sup>5</sup> It has also updated its methodology for digital economy diagnostics with version 2.<sup>6</sup>

The reasons for the inadequate treatment of inclusion and poverty in digital economy diagnostics are twofold (Hanna 2019). First, relevant Global Practices have limited participation in the preparation of digital diagnostics. For example, the lack of participation by the Social, Urban, Rural, and Resilience Global Practice may have resulted in failing to account for major spatial inequalities (important in a large, diverse country like the Russian Federation, where national averages for digital economy indicators miss local variation). Other Global Practices that also tend to be excluded are the Poverty; Education; Health, Nutrition, and Population; and Governance Global Practices. Participation by the regional chief economist's office would also be important for the inclusion agenda, which may be neglected if left solely to ICT specialists. Second, disaggregated data are lacking. The International Telecommunications Union, for example, generates data on the number of households with internet access but not necessarily on internet usage or how this varies across income groups or across dynamic and lagging Regions.<sup>7</sup> Given its expertise in development data, this is a gap the Bank Group could help fill.

Finally, there has been insufficient attention to linking the support for digital technologies to the twin goals in two Bank Group regional initiatives:

the Bank Group’s MNA Tech program and the DE4A Moonshot/Accelerate. The MNA Tech Concept Note did not mention how it would help contribute to the twin goals or discuss links between digital connectivity and poverty (poverty is mentioned twice in the 61-page Concept Note and is left out of the theory of change) (World Bank 2019b).<sup>8</sup> The Concept Note for the DE4A Moonshot/Accelerate did not discuss some of the big risks from DTT, such as income inequality resulting from automation (World Bank 2019a).

## Skills and Capabilities for the New Economy and the Role of Education

The fast pace of technological change likely means that individuals will have more than one career in their lifetime, which in turn means that they will need to continually learn new skills. Individuals will need to adopt a growth mindset, or the ability to “learn to learn” and to adapt to new jobs (box 2.2). The Bank Group’s FY20–22 Human Resources Strategy has recognized the need for staff to embrace a growth mindset for continuous learning. The garment industry illustrates how the nature of jobs will change. Sewbots are likely to replace at least some garment factory jobs, and new jobs of the future will involve using and producing sewbots. Those who cannot transition from manual sewing will likely lose out. According to the World Economic Forum (2018), access to economic opportunities will require individuals to remain competitive so that businesses have the talent they need for the jobs of the future.

Imparting skills that allow children to acquire a growth mindset or the ability to “learn to learn” and adapt will be key, given the rapidly changing job market. The Inter-American Development Bank has pointed out that students who begin primary school today will graduate from university in the mid-2030s, and their careers will last through 2060 or beyond (IDB 2018).<sup>9</sup> The Bank Group has recognized the necessity of students continually acquiring new skills. A recent Technology for Youth Empowerment and Value Exchange (Evoke) project in Colombia takes a “sandbox” approach and uses blockchain and crypto-tokens to improve the process by which students are incentivized to develop the skills necessary to create innovative solutions to local challenges. Three recent World Development Reports dealing with digital dividends, education, and the changing nature of work identify the need to provide future workers with cognitive, technical, and socioemotional skills (World Bank 2016e, 2018h, 2019m). Other World Bank

publications have also contributed to the literature on the importance of socio-emotional skills (see, among others, Cunningham, Acosta, and Muller 2016; Cunningham and Villaseñor 2016; Guerra, Modecki, and Cunningham 2014; Puerta and others 2016). In its Step by Step Social and Emotional Learning Program for children and teens, the World Bank outlines six core life skills for children ages 6 through 17 that foster social responsibility, autonomy, and resilience.

### **Box 2.2.** The Unpredictability of the Future Job Market and the Importance of a Growth Mindset

According to historian Yuval Noah Harari:

“The crucial problem isn’t creating new jobs. The crucial problem is creating new jobs that humans perform better than algorithms. Since we do not know what the job market will look like in 2030 or 2040, already today we have no idea what to teach our kids. Most of what they currently learn at school will probably be irrelevant by the time they are 40. Traditionally, life has been divided into two main parts: a period of learning followed by a period of working. Very soon this traditional model will become obsolete, and the only way for humans to stay in the game will be to keep learning throughout their lives, and to reinvent themselves repeatedly” (Harari 2016).

Psychologist Carol Dweck has observed that “in a growth mindset, people believe that their most basic abilities can be developed through dedication and hard work—brains and talent are just the starting point. This view creates a love of learning and a resilience that is essential for great accomplishment” (Dweck 2006).

Dweck argues that when people believe that their intellectual abilities can be developed, they have a desire to learn and, therefore, a tendency to embrace challenges, persist in the face of setbacks, see effort as a path to mastery, learn from criticism, and find lessons and inspiration in the success of others—all of which help people reach even higher levels of achievement.

People who operate with a fixed mindset are more likely to stick to activities that use skills they have already mastered rather than risk embarrassment by failing at something new. People focused on growth make it their mission to learn new things, understanding that they won’t succeed at all of them—or at first.

*Source:* Dweck 2006; Dweck and Yeager 2019; Harari 2016; Yeager and others 2019.

DTT have a critical role to play in education to equip workers and children for the jobs of the future. Key intersections between education and DTT include the following:

- » The “application” of DTT to *improve education* (for example, by using computers in the classroom).
- » The use of education as a “response” to DTT to prepare people for a world disrupted by DTT, imparting twenty-first century skills, by
  - » Preparing people to *develop or produce* DTT (for example, by teaching advanced cognitive skills, including higher-order problem solving and creative thinking);
  - » Preparing people to *use or consume* DTT (for example, by teaching digital literacy); and
  - » Preparing people for new jobs in which *humans have the comparative advantage* (for example, by teaching socioemotional skills, including empathy, curiosity, intrinsic motivation, grit, communication, teamwork and collaboration, leadership, global awareness, self-regulation, conflict resolution, relationship management, and, in particular, a growth mindset or the ability to “learn to learn”—to be lifelong learners and adapt to change).

The World Bank’s education lending and ASA over the past five years have focused more on the application of DTT and less on the response to DTT in preparing children for the twenty-first century (appendix A provides details on the identification of lending projects and ASA):<sup>10</sup>

- » Regarding lending, of the 163 education projects approved during FY15–19, 57 projects (35 percent) had at least one DTT-relevant objective, component, or indicator.
- » Of these 57 education projects (35 percent) with at least one DTT-relevant objective, component, or indicator, 79 percent provided support for the application of DTT to *improve education*, 11 percent provided support for preparing people to *develop or produce* technology in the new economy, 4 percent provided support for preparing people to *use or consume* technology in the new economy, and 21 percent provided support for preparing people for new jobs

in which *humans have the comparative advantage* (italics show the key intersections between education and DTT discussed in the previous paragraph).<sup>11</sup>

- » Regarding ASA, of the 403 education-related ASA approved during FY15–19, only 15 percent had at least some DTT-relevant discussion in ASA abstracts or ASA documents. The scarcity of DTT-relevant analysis in ASA is of particular note, as it is in such analysis that new areas or innovations reflecting future educational and labor market needs and the role of DTT can be explored.

The Bank Group has an opportunity to spotlight twenty-first century skills and highlight both necessary and sufficient skills. The Bank Group’s flagship Human Capital Project (adopted by 77 countries in 2020 from just 28 early adopters in 2018) and Learning Poverty initiative (which includes an ambitious new learning target that aims to cut by at least half the global rate of learning poverty by 2030) seek to address fundamental gaps in learning outcomes.<sup>12</sup> The Human Capital Index focuses on reading and math and the Learning Poverty initiative on reading and understanding a simple text.<sup>13</sup> The Bank Group has an opportunity to move the narrative forward from necessary skills such as literacy and numeracy to include twenty-first century sufficient skills such as advanced cognitive skills, digital literacy, and socioemotional skills, particularly a growth mindset or the ability to “learn to learn” and adapt.<sup>14</sup> Both necessary and sufficient skills are critical for ensuring that a workforce is well prepared for the future labor market. There are strong reasons for imparting these skills simultaneously—not sequentially—from early childhood itself, recognizing the profound positive effect on brain development and lifetime capabilities. Imparting sufficient skills may also serve the nascent demand from developing countries that are aspiring to grow and catch up by becoming knowledge-intensive economies and for reducing the North-South divide (UNESCO 2015).

DTT are emerging as an important mechanism in the context of COVID-19, given their relevance for social distancing and online learning. The Bank Group estimated that because of the pandemic, close to 1.6 billion children and youth in 161 countries were out of school as of April 2020. To minimize disruption to learning while schools are closed, countries are using various online learning technologies (for example, computers, tablets, or mobile phones) and off-line distance learning technologies (for example, TV or

radio) to reach children remotely. World Bank support in this regard comprises (i) providing (on its EdTech website) guiding principles for short and long-term distance learning plans; (ii) maintaining a catalog of emerging approaches that documents how education systems are responding around the world; and (iii) maintaining a list of resources and platforms that identifies helpful technological solutions to support remote learning, covering off-line distance learning and online learning. Box 2.3 discusses the Bank Group's experience with off-line distance learning and online learning. IFC has supported education technology clients through its venture capital investments, such as Byju's in India, with the objective of providing solutions to adapt education and learning to COVID-19.

### **Box 2.3.** Leveraging World Bank Group Experience with Off-Line Distance Learning and Online Learning in Responding to COVID-19

The World Bank Group's experience with off-line distance learning and online learning provides pointers in the context of the coronavirus (COVID-19). A review of a sample of recent education projects for this evaluation highlighted Bank Group experience with online learning, which has been used so far to (i) improve teacher training; (ii) reach spatially diverse populations; (iii) improve assessments in the classroom; and (iv) support blended learning, combining traditional face-to-face teaching methods and resources (textbooks, for example) with digital resources (such as tablets and e-learning). Follow-up interviews with key staff working in education and technology provided insights about the Bank Group's use of both off-line distance learning and online resources and how these may be leveraged in responding to COVID-19.

The Bank Group's experience with off-line distance learning and online learning points to the following challenges, which it will need to address as it ramps up its COVID-19 response and continues to provide ongoing education support:

- » **Developing high-quality digital content in a format that follows pedagogical principles.** Bank Group interviewees noted that although some open-source digital content is available, a key challenge is to prepare and make available pedagogical material that captures the attention of all students. They pointed to a shortage of digital curriculum expertise in the Bank Group.

*(continued)*

### Box 2.3. Leveraging World Bank Group Experience with Off-Line Distance Learning and Online Learning in Responding to COVID-19 (cont.)

- » **Training teachers to effectively deliver digital content.** Although online learning has been increasingly deployed for this purpose, this needs to keep in step with the capacity and connectivity of the receiver.
- » **Ensuring a systems approach that develops all the necessary complements for digital education.** This includes developing digital content, digital teaching, assessment data, infrastructure and device financing, and connectivity, since just distributing laptops does not improve learning outcomes.
- » **Ensuring equitable access to infrastructure for connectivity** through, for example, access to tablets, computers, wind-up radios, and TVs. This remains an issue in several countries and in several parts of each country.
- » **Effectively delivering blended learning, which combines face-to-face teaching with digital instruction.** This may be highly relevant in the short term, as children may be sometimes in and sometimes out of school, depending on progress in controlling the pandemic.
- » **Building back better.** The development literature suggests that crises often tend to galvanize support for change and make reforms easier. The COVID-19 pandemic presents the Bank Group with an opportunity to take bold action (for example, in strengthening curriculums to address job markets of the future), so that the education system that emerges after COVID-19 will be more relevant to twenty-first century needs than it might otherwise have been.
- » **Strengthening networks and partnerships.** Great strides in online learning are occurring through governments, educational institutions, the private sector, and others. Collaboration and partnerships can keep the Bank Group's work state of the art.

Source: Independent Evaluation Group review.

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<sup>1</sup> Details about the Global Facility for Disaster Reduction and Recovery can be found at <https://www.gfdr.org/en/feature-story/using-technology-stay-ahead-natural-disaster-risk>.

<sup>2</sup> The overall discussion of skills and capabilities for the new economy and the role of education, especially in the context of the Human Capital Project, covers Bank Group support, whereas analysis of the education lending and advisory services and analytics (ASA) over the past five years covers the World Bank only.

<sup>3</sup> For more information about the Bank Group’s education programs, see <https://www.worldbank.org/en/topic/education>.

<sup>4</sup> Hanna (2019) assessed a purposive sample drawn from the Digital Economy Country Assessment, Digital Economy Country Assessment 2.0, Digital Economy for Africa, and Digital Government Readiness Assessment of pilots that were at a sufficiently advanced stage of implementation or drafting to generate important lessons, covered different Regions, included countries at different levels of development, or adopted different assessment tools and processes. The countries were the Kyrgyz Republic, Malaysia, the Russian Federation, Senegal, and Tunisia; there was also a multicountry assessment of Indonesia, Malaysia, Thailand, and Vietnam. Assessment reports and documentation for several other countries and regional initiatives that were reviewed in less depth included those for Kenya, Lesotho, and the MNA (Middle East and North Africa) Tech Initiative.

<sup>5</sup> IEG has not evaluated the recent digital diagnostics.

<sup>6</sup> Version 2 is available on the Digital Economy for Africa public webpage: <https://www.worldbank.org/en/programs/all-africa-digital-transformation>.

<sup>7</sup> Household surveys and administrative data of the kind the Bank Group collects will likely be required to address such questions.

<sup>8</sup> MNA Tech is part of the Middle East and North Africa Strategy, and the latter emphasizes the achievement of the twin goals.

<sup>9</sup> “To prepare for the 2030s and beyond, emerging economies have an opportunity to leapfrog, to prepare their youth for the careers of the future. Our schools should teach the curriculum of the future, not just the curriculum of the past” (IDB 2018).

<sup>10</sup> The International Finance Corporation is also engaged in education through venture capital education technology companies, but these were not evaluated here.

<sup>11</sup> One project could fall into more than one category.

<sup>12</sup> The Human Capital Project notes that children in many countries are struggling to learn in school (with nearly 60 percent of primary school children in developing countries failing to achieve minimum proficiency in learning) and that countries often underinvest in human capital (Gatti and others 2018, 2, 14). Furthermore, the learning poverty indicator (the percentage of children who cannot read and understand at age 10) stood at 53 percent of children in low- and middle-income countries. See also Saavedra 2020.

<sup>13</sup> The Human Capital Index is a tool designed to measure how well a country is doing in terms of fulfilling its human capital potential. It converts core indicators on survival, schooling, and health into measures of worker productivity (World Bank 2020b).

<sup>14</sup> Recent initiatives of the Bank Group for promoting digital literacy include technology efforts in the Education Global Practice portfolio. There are increasing efforts to support the development of digital skills both in basic and higher education for teachers, principals, and learners. This encompasses support for the enabling environment, including digital infrastructure, data systems, and digital learning resources. Together with the technology and innovation team, the Education Global Practice has developed an external Community of Practice in this area, engaging partners such as the Massachusetts Institute of Technology, Stanford University, University of Wisconsin, Microsoft, Lego, the UK Department for International Development, and the US Agency for International Development. Furthermore, as part of the Partnership for Skills in Applied Sciences, Engineering, and Technology program, the World Bank and its partners are supporting the development of a Digital Skills Action Plan that will guide Country Action Plans for digital skills in Africa. Digital skills comprise both digital literacy skills, which are required by citizens and workers in many occupations, and specialized digital skills for the information and communication technology professions. The Digital Skills Action Plan will support five strategies: (i) enabling policies and a digital skills framework; (ii) reforming digital skills programs; (iii) using technology in teaching and learning; (iv) connecting institutions to high-speed internet; and (v) building capacity and reengineering business processes.

# 3 | Staff Skills and Mindsets for DTT Support

## Highlights

The World Bank Group's fiscal year 2020–22 Human Resources Strategy presents key insights about the staffing issues that confront the Bank Group. Reflecting the latest thinking in organizational psychology, it recognizes the need to build new staff skills and expertise and foster a growth mindset for continuous learning in the face of rapid technological change.

This evaluation found that the Bank Group has yet to (i) identify the staff skills needed to harness disruptive and transformative technologies (DTT) opportunities and mitigate DTT risks; (ii) ensure that its information systems and databases provide information on its current DTT-relevant skills; and (iii) take action to fill any gaps.

Expertise across institutions and units is not leveraged efficiently, especially in bringing together the DTT expertise of technology staff and the sector knowledge of specialists and task team leaders.

The number of existing staff with DTT-relevant skills is insufficient to meet client demand, especially in areas such as regulatory reform, data privacy, cybersecurity, 5G networks, and artificial intelligence; consequently, staff with these skills are often overstretched. A mindset for continuous learning and adaptation is also lacking in the Bank Group.

## DTT-Relevant Staff Skills and Mindsets

Providing DTT support requires specific skills and mindsets. DTT-relevant skills include those that enable Bank Group staff to (i) provide informed advice to clients on technology policy, regulation, and standards; (ii) guide clients about risks such as income inequality, data privacy, or cybersecurity; and (iii) help clients mine large data sets for policy insights. DTT-relevant mindsets include those that ensure that Bank Group staff (i) learn continuously and adapt to technological change; (ii) use innovative solutions to tackle development challenges; and (iii) adopt an entrepreneurial (problem-solving) approach to address new development challenges.

## Bank Group Recognition of Key Issues

The Bank Group has recognized the necessity of upgrading staff skills and the need for staff to embrace a growth mindset for continuous learning, given the rapid changes caused by DTT.

The Bank Group's Mainstreaming paper acknowledges the importance of addressing staff skills in providing DTT support (World Bank 2019h). The paper notes that the Bank Group is using the annual business planning process to plan for the impact of disruptive technologies on the emerging skills it will need.

The Bank Group's FY20–22 Human Resources Strategy notes that one of the “most pressing challenges” is skills gaps that impede delivery of changing Bank Group priorities, including thought leadership on disruptive technologies. The strategy also mentions the need for staff to embrace a growth mindset for continuous learning. Furthermore, the strategy recognizes that the Bank Group will need to build a pipeline of future leaders possessing skills such as emotional intelligence and resilience, collaboration, problem solving, critical thinking, innovation proactivity, and continuous learning.

The Bank Group recognizes the need for staff who can innovate, given the interconnectedness of DTT and innovation. A 2017 World Bank report notes the importance of having staff with technical expertise and staff with the right mindset or attitude as a prerequisite for innovation, including technological innovation (World Bank 2017c). Drawing on IEG's *Supporting Transformational*

*Change* evaluation (World Bank 2016c), the 2017 report emphasizes the importance of staff with an entrepreneurial attitude and a willingness to take risks. The report also flags hiring and retention challenges at the Bank Group that have bearing on the diverse skills needed for innovative work.

The World Bank recognizes that operational involvement in incorporating technology in World Bank–supported projects still tends to be piecemeal. A forthcoming ASA, *The Converging Technology Revolution and Human Capital: Potential and Implications for South Asia*, notes that although operational involvement in incorporating technology is widespread across many World Bank–supported projects in the South Asia Region, it still tends to be piecemeal and “pilot-focused” (Bashir and others, forthcoming). The ASA explains that technology and innovation are rapidly changing, while the skills mix of staff is largely unchanged, with limited basic knowledge and lack of dedicated funds and technical resources for task team leaders to experiment with innovation. Furthermore, it notes that engagement with local country experts and with global experts is limited by lack of both time and basic knowledge of technology trends and issues.

## IEG Findings

- » Based on the IEG-DECDG joint analysis of staff skills for DTT support undertaken for this evaluation, the key findings are that the Bank Group has yet to (i) identify the DTT-relevant skills that it needs; (ii) ensure that its information systems and databases contain the necessary information on its current DTT-relevant skills; and (iii) take action to fill any gaps.

IEG—in collaboration with DECDG—assessed the state of the Bank Group’s current staff skills in providing DTT support. The assessment asked this question: Within the Bank Group, how widespread are the technical skills and experience that are relevant for DTT support across the Regions? The objective was to gain insight into the Bank Group’s current state of preparedness to help clients harness DTT opportunities and mitigate risks and to generate recommendations. IEG and DECDG developed a two-part approach to the assessment (see box 3.1). The approach was impractical, given the findings listed and described in this section.

### Box 3.1. IEG and DECDG's Two-Part Approach to the Staff Skills Assessment

**Part One: Defining terms.** The Independent Evaluation Group and the Development Economics, Development Data Group investigated whether the Bank Group Human Resources Department had created a taxonomy of skills and competencies using consistent definitions. Such a taxonomy would facilitate an assessment using standard Bank Group-wide definitions and would help avoid definitional confusion. The existence of SkillFinder suggested that such a taxonomy might exist, which would be useful for assessing the current state of skills and competencies relevant for disruptive and transformative technologies (DTT) and for clarifying any recommendations that the assessment might generate.

**Part Two: Gathering and analyzing relevant data.** The Independent Evaluation Group and the Development Economics, Development Data Group worked jointly to devise a list of proxy data (from SkillFinder, People Profile pages, human resources, and other institutional sources), which, although perhaps not a precise account of the current staff skills and experience relevant for providing DTT support, might at least yield actionable insights. This list included the following:

- The number (and proportion) of Bank Group staff who have skills and competencies relevant for providing DTT support, and the following information:
  - » How these staff are spread across Regions, Global Practices, grade levels, and geographical locations (headquarters versus country offices)
  - » The number of years of service they have completed in the Bank Group
  - » Their primary, secondary, and tertiary specializations
  - » Their professional, cross-cutting solutions areas (now called Global Themes), and Global Solution Group affiliations
  - » Their current mapping to career streams and job families
  - » Which talent boards or career advisory panels oversee and advise on their career management
  - » The sector and theme codes associated with the projects and advisory services they have led as a task team leader
  - » Previous experience at other organizations relevant to DTT.
- The Bank Group's Communities of Practice and Yammer groups. These would conceivably offer an insight into how many staff were sharing their interest or experiences in working on DTT.

*Source:* Independent Evaluation Group and Development Economics, Development Data Group research.

SkillFinder did not provide reliable information for assessing DTT staff skills and gaps. The SkillFinder mechanism was self-reported and optional. At the time this evaluation was being conducted, only 21 percent of World Bank staff had self-reported their skills and competencies.<sup>1</sup> SkillFinder contained about 6,200 individual skill entries, but there was no taxonomy of skills, and no definitions had been assigned to any skills. The skills list was simply an open text field into which staff could enter what they chose. There was no oversight or governance of SkillFinder. Given the small percentage of World Bank staff who had opted in and the fully subjective nature of the skills reported, it was determined that the data would not be useful for this evaluation.

Although there are some improvements, many of the SkillFinder problems persist in the recently updated People Profile pages. The updated People Profile pages software now encourages staff to fill in their profile by showing them how much of their profile is incomplete. All official areas of expertise have been merged into a single attribute, eliminating the need for a staff member to specify primary, secondary, or tertiary specializations. The lack of a skills taxonomy and definitions of skills, incomplete staff profiles, and absence of oversight or a governance mechanism, however, are persistent gaps in the updated People Profile pages. Coursera and LinkedIn provide working examples of skills taxonomies from which the Bank Group could glean relevant ideas.<sup>2</sup>

The usefulness of much of the other staff data (identified in box 3.1) is contingent on gathering good-quality data on Bank Group staff skills and competency. For example, information on geographic locations, specializations, affiliations, career streams, job families, projects and ASA, and previous occupations is moot if good-quality Bank Group staff skills and competency data are missing.

Obtaining curriculums vitae (CVs) of Bank Group staff is not straightforward since no electronic database compiles all staff CVs using a standard structure and format, and CVs are also self-reported with no oversight. This means that there is the possibility that CVs may under- or overreport academic qualifications and work experience or report them in various ways.

Gathering information on the Bank Group's Communities of Practice (CoPs) is likewise not straightforward; the only readily available information is an inventory of CoPs but not membership. Moreover, some CoPs are Microsoft

email groups and others are Outlook groups, and all manage their membership through nonpublic email distribution lists, for which points of contact are not readily identifiable. Of the few CoP focal points that this initial analysis yielded, some were hesitant to share membership details. Further investigation is necessary to canvass CoP members and CoP focal points, demonstrate to them why these data are necessary for analysis, and obtain listserv information.

An examination of World Bank Yammer groups also does not provide insights into the range of skills relevant to DTT. IEG and DECDG investigated whether a relationship exists between staff membership in World Bank Yammer groups and thematic relevance to DTT. Analysis of World Bank Yammer groups found that these groups are informal and open to all World Bank staff, based on an enrollment ethos that promotes awareness of and engagement with a particular subject. As such, there are no threshold criteria for technical expertise or operational experience to create a group, nor is there a representative number of groups across the World Bank's thematic areas relevant to DTT work. Although Yammer groups may coalesce around DTT-relevant themes,<sup>3</sup> they are not a source of information on the DTT-relevant staff skills of their members.

» In Bank Group staff interviews conducted for this evaluation, interviewees reported shortages of staff possessing DTT-relevant skills, pointing out that existing staff with these skills were often overstretched. Interviewees also reported that mindsets for continuous learning and adaptation were lacking in the Bank Group.

IEG's analysis of the interview data using NVivo suggested that the Bank Group has insufficient DTT-relevant skills or mindsets.<sup>4</sup> Of the 70 interviewees who talked about staff skills, 52 interviewees (or 74 percent) reported a lack of DTT-relevant skills. Of the 28 interviewees who talked about staffing mindset, 22 interviewees (or 79 percent) reported a lack of a DTT-relevant mindset.

Interviewees generally indicated that too few Bank Group staff have DTT-relevant skills. Although there have been recent initiatives to build DTT-relevant skills (box 3.2), interviewees noted that there are not enough ICT specialists, regulation experts, geospatial specialists, data managers, data scientists, statisticians, and technology lawyers. There being few available DTT-skilled

experts means that often those experts are not able to respond to existing client demand in areas such as regulatory reform, data privacy, cybersecurity, 5G networks, intellectual property issues,<sup>5</sup> and AI and often become overstretched. The lack of DTT-skilled experts may also mean that Bank Group policy dialogue is weakened, especially when the client is better versed in the latest technologies than Bank Group staff. Bank Group interviewees also mentioned a shortage of technical experts on ID4D. Demand from country clients for ID4D support has grown substantially, even as a billion people globally are still unable to prove their identity and millions more have forms of identity that cannot be reliably verified or authenticated. In a country visit undertaken for this evaluation, country clients noted that the Bank Group often provides generic advice, which may suggest a lack of expert knowledge on specific technologies. Interviewees noted that staff with cutting-edge digital skills can be forced into more generalist roles, potentially making it difficult for them to keep up with relevant developments in the digital world. Furthermore, successful DTT support depends on staff acquiring and using relevant skills and adopting a growth mindset, but interviewees highlighted some caveats regarding this at the Bank Group. In particular, a mindset that favors standard or normal projects over those requiring new learning or techniques constrains skill acquisition and development.

Bank Group interviewees in the Digital Development Global Practice and IFC corroborated a shortage of DTT-skilled staff. Recent IFC hiring has sought to address gaps in DTT-relevant expertise. Interviewees noted that staff dedicated to fintech and digital entrepreneurship generally have the technical capabilities and necessary skills and are often able to reach out to qualified consultants to supplement these skills. Nevertheless, World Bank interviewees working on digital development pointed to insufficient expertise, especially for regulation of technological companies and platform firms, and in data privacy, cybersecurity, and DTT-relevant procurement. Regarding IFC, interviewees noted that staff can respond to much of the demand, but that they could do more if the venture capital and fintech teams had more qualified staff. Furthermore, they noted that IFC has good industry specialists in debt financing who understand the sector and keep up with technological changes, as well as solid investment staff, but it needs more specialists in mezzanine and equity products, which require very different skills than

those needed for working on debt. More recently, following IFC’s reorganization and the creation of the Disruptive Technology and Funds and Upstream units in FY20, IFC has begun to increase staff in DTT-relevant areas, including specialists in AI and machine learning. However, it is too early to assess the effectiveness of these measures.

### Box 3.2. Recent Initiatives to Build Skills Relevant to Disruptive and Transformative Technologies

A number of recent initiatives in the World Bank are supporting learning for staff with roles related to disruptive and transformative technologies:

- » The World Bank’s Open Learning Campus aims to facilitate online university degrees for staff on artificial intelligence, blockchain, internet of things, cybersecurity, 5G, and regulation.
- » Information and Technology Solutions has a Technology and Innovation Lab whose goal is to “serve as a catalyst, enabler and accelerator for Bank Group staff to learn about and build expertise around emerging technologies’ potential to support the Bank Group development agenda.” It also has an active staff learning program (Learn2Innovate) that partners with Global Practices for learning sessions on topics such as blockchain, artificial intelligence, and other technologies with potential applications to the World Bank’s work. It aims to apply design thinking principles to the projects it explores and prototypes it develops to ensure that the solutions reflect end-user preferences.
- » Sustainable Development has a learning program on the use of technologies for remote preparation and supervision for projects, including remote supervision using virtual reality.

Source: World Bank data.

Interviewees noted insufficient focus on learning and adaptation. The lack of learning inhibits adaptability, which has been called the “new competitive advantage” (Reeves and Deimler 2011). An adaptability quotient has recently been proposed to measure the extent to which individuals and organizations will thrive in the twenty-first century.<sup>6</sup> IEG’s second Learning and Results

evaluation noted that a learning mindset is hindered at the World Bank by weak handover arrangements between incoming and outgoing task team leaders, poor on-the-job mentoring, insufficient focus on lesson learning by the peer review system, and inadequate rewards for learning and knowledge sharing (World Bank 2015a).

Developing the requisite skills to support DTT for development could come from a combination of new recruitment (of staff, consultants, or both), retraining, secondments, outsourcing, and external partnerships. Bank Group interviewees discussed scenarios in which one or some combination of these might apply. New recruitment would be best in situations where DTT-relevant skills are continuously needed, as in the case of data scientists, for example. Education sector staff noted that the EdTech Fellows program, with 25 fellows—including some newly recruited by the Bank Group—could provide lessons, both positive and negative, on instilling openness to new technologies and enhancing specialized skills for DTT for development. Interviewees identified retraining as an option for staff who already had the technical foundation on which to build. Client interviewees noted that Bank Group advice did not always promote the latest relevant technologies,<sup>7</sup> and staff interviewees perceived insufficient investment in training for DTT-relevant skills and poorly targeted training.<sup>8</sup> Secondments offer a viable option for growing lines of business, where the Bank Group could consider hiring seconded staff after having tested them during the secondment period. Outsourcing specific DTT functions may be considered for highly specialized or temporary needs. Finally, external partnerships with other development organizations, the private sector, academia, or nongovernmental organizations could also help access missing skills and spur innovation.<sup>9</sup> External partnerships could also help the Bank Group increase the scale of projects, for example in education by partnering with companies whose online teacher training platforms are accessed by millions of teachers. A few recent partnerships provide some lessons (appendix G discusses the Famine Action Mechanism and the Bank Group–LinkedIn partnership).

Interviewees noted that for the Bank Group to be at the forefront of DTT for development, Bank Group staff would benefit from opportunities to engage with top-level technology experts. Lokshin and Sajaia (2019) note that to be a trusted adviser, the Bank Group should “support a strong team of top-level

development experts integrated into the international tech community.” Furthermore, Bank Group interviewees reported that access to development practitioners in leading technology companies that are taking on development roles would also encourage the flow of knowledge and expertise across technology and development domains, sparking fresh solutions to complex development challenges. A DTT knowledge platform that combines such expertise could contribute to the Bank Group’s DTT thought leadership and enable it to use cutting-edge DTT knowledge in the pursuit of the twin goals.

Bank Group staff and managers pointed to the need to better leverage the DTT expertise of technology staff and the sector knowledge of specialists and task team leaders. A point of convergence in staff and managerial interviews was that the Bank Group needs staff with technological expertise who are familiar with what the institution does and who could be the technological connectors with sector specialists, operational task team leaders, clients, and vendors. Furthermore, the Bank Group needs task team leaders who are open to adopting technological solutions, which can be achieved through targeted training sessions.

IFC interviewees perceived that DTT expertise in the TMT group initially suffered from the realignment of TMT teams that now report to regional infrastructure units (rather than to TMT at headquarters) and from rotating non-DTT staff into DTT positions, which diluted IFC’s ability to maintain thought leadership in DTT. The workforce planning and restructuring in recent years has resulted in losing some middle management and knowledgeable staff. These individuals had been the ones informing senior management and instilling knowledge in younger staff. Recent initiatives, such as training bootcamps, knowledge sharing, and systematic sector mapping have aimed to improve IFC’s thought leadership and expertise. In addition, some IFC teams, such as those working in fintech and venture capital, have maintained and in some cases added to their expertise.

» Previous research undertaken by the Bank Group had identified a shortage of staff with data science and statistical skills—skills required to generate and analyze granular development data for policy insights.

There is a shortage of staff with data science and statistical skills in the Bank Group. The Development Economics Vice Presidency and Human Resources

undertook a snapshot analysis in 2018 using staff job titles, which determined that 84 staff were working on statistics and data issues. Of these, 43 worked in Development Economics, 13 were in Global Practices, and the remainder were in institutional, governance, and administration units (such as ITS and Treasury). IFC also identified a dearth of data scientists and a lack of the mindset and business culture needed to employ these data scientists effectively. At the 2019 Data Day, then Bank Group CEO Kristalina Georgieva noted that there were fewer than 100 operational data scientists and statisticians and that she wanted this number to grow and for these staff to also increase their skills. The newly launched Data Governance body and its supporting Data Governance Steering Committee—set up to provide executive leadership, oversight, and support for data-related matters—is a positive development.

Bank Group data scientists and statisticians have limited institutional visibility, limited opportunities for mobility and advancement, and limited opportunities for career development. The Bank Group is missing an opportunity to benefit from a functioning market of data science and statistical knowledge that could be mobilized to enhance rapid and effective services to internal and external clients. Cutting-edge data science and statistical capability is essential in the Bank Group because such expertise can help in both generating more granular development data and analyzing them in ways that yield more granular policy insights for the twin goals. Collaborative work by the Group Internal Audit (formerly the Internal Audit Department of the Bank Group) and DECDG pointed to the lack of a career stream for data scientists and statisticians and recommended that this be addressed (World Bank 2016d). Bank Group management committed to this as part of the Management Action Record for the Group Internal Audit report. A subsequent 2018 Development Economics study found recruitment of data scientists and statisticians had been ad hoc, with no consistent process to ensure standards of selection, promotion, or skill enhancement to meet institutional needs. This also meant that there were limited opportunities for current data science and statistics staff (de facto) to interact, share knowledge, or move into appropriate positions. A 2019 analysis by the Group Internal Audit pointed to analogous findings (World Bank 2019j). In a positive development, discussions continue concerning possible next steps for the creation of a Bank Group career stream for data scientists and statisticians.

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<sup>1</sup> SkillFinder covered only World Bank staff, but the People Profile page has been released Bank Group-wide.

<sup>2</sup> Coursera is focusing on skill development in three subject areas, given that these domains cover skills that will increasingly become crucial to the future of work. Two of these subject areas are technology and data science (the third is business). Coursera has developed a taxonomy of over 40,000 skills in these three areas and has developed competencies and skill levels. See Coursera's Global Skills Index: <https://pages.coursera-for-business.org/rs/748-MIV-116/images/global-skills-index.pdf>.

<sup>3</sup> At the time this evaluation was being conducted, the following Yammer groups were examined: Digital Transformation Collection—World Bank Group; Digital Transformation of Energy; Digital Financial Services in Africa; Digital Agriculture and Food; Digital Development Community of Practice; Digital Governance GOV Global Practice Community of Practice; Information and Technology Solutions Technology and Innovation Lab—Tech Community; MNA Tech Community of Practice; and GovTech Leadership Group—World Bank Group.

<sup>4</sup> The phrase “lacks sufficient DTT-relevant skills or mindsets” refers to either an insufficient number of staff with DTT-relevant skills or insufficient DTT-relevant skills or mindsets in staff.

<sup>5</sup> For example, equitable and appropriate technology partnerships with the private sector may require new business and legal skills, as well as leveraging the World Intellectual Property Organization relationship, where relevant.

<sup>6</sup> See Natalie Fratto's TED Talk, May 2019: [https://www.ted.com/talks/natalie\\_fratto\\_3\\_ways\\_to\\_measure\\_your\\_adaptability\\_and\\_how\\_to\\_improve\\_it](https://www.ted.com/talks/natalie_fratto_3_ways_to_measure_your_adaptability_and_how_to_improve_it).

<sup>7</sup> Client interviews noted that Bank Group advice on climate change, agriculture, and education did not necessarily promote the latest relevant technologies such as the digital tracking of water leakages, artificial intelligence for crop monitoring, or smart classrooms.

<sup>8</sup> Interviewees cautioned that trainers need to be carefully selected and noted that the Bank Group could reshape its retraining programs to incorporate lessons learned in Silicon Valley. They also noted that it would not be efficient to use the most highly skilled data scientists to provide basic DTT training to generalist task team leaders. They suggested that basic training in DTT could be mandatory for most staff and that more specialized, higher-level training (for example, in artificial intelligence, 5G networks, or blockchain) could also be provided for a smaller group of relevant staff.

<sup>9</sup> Engaging in the budding movement of public interest technology on college campuses can be helpful to capture cutting-edge knowledge and harvest fresh ideas.

# 4 | Internal Processes and Procedures for DTT Support

## Highlights



### Collaboration



The need for collaboration is underlined by the wide-ranging nature of disruptive and transformative technologies (DTT) projects that cut across sectors and often involve both public and private institutions.



This evaluation found that there are examples of effective collaboration for DTT support, for example Development Data Partnership (formerly Data Collaboratives), the Digital Central Asia–South Asia program, Geo-Enabling for Monitoring and Supervision, and Identification for Development.



However, overall, there was a perception among interviewees from across Global Practices that collaboration is insufficient among the different Global Practices, with instances of competition for task team leadership.



Given that contributions from both public and private sectors are necessary for successful DTT-related outcomes, the lack of collaboration between the World Bank and the International Finance Corporation was also an issue.



### Procurement



Procurement is a major implementation constraint in DTT-related projects.



There is only fragmented guidance for complex technology projects, specifically on the risks associated with these projects (such as vendor lock-in, lack of interoperability of systems, potential loss of data ownership and lack of data privacy, limitations in technology-specific legislation and regulation, and mismatch between business processes and the requirements of the particular technology). There is also insufficient guidance on how the flexibility available for complex technology projects in the World Bank's procurement systems can be applied in different situations.

# Collaboration

## DTT-Relevant Collaboration

The need for greater collaboration in providing support in a cross-cutting area like DTT is underlined by the importance of the analog complements to digital technologies. These analog complements include improving the business climate, investing in people’s education and health, and promoting good governance (World Bank 2016e). Consequently, effectively harnessing DTT in development requires cross-sectoral links and collective (rather than individual) action. When an organization fails to foster sufficient collaboration among relevant departments in its DTT support, the division of labor may become inefficient and inhibit innovative solutions (Epstein 2019). The need for collaboration is also underlined by the role of both public and private institutions in implementing complex technology solutions (World Bank 2011a).

Bank Group DTT-related projects are wide ranging and illustrate why cross-sectoral collaboration is necessary. For example, a 2019 Tunisia project, GovTech Digital Transformation for User-Centric Public Services, aims to improve equitable access to and the quality and accountability of social protection and education services through a GovTech approach, targeting low-income groups, the vulnerable, women, the illiterate, and persons with disabilities. This wide-ranging objective would be addressed best by bringing to bear expertise in each of the identified areas (for example, collaboration across governance, education, poverty, social protection, digital development, competitiveness, and innovation).<sup>1</sup> The importance of collaboration in providing DTT support—not just coordination or cooperation—is also emphasized in a recent publication: “Rather than the business specifying what was needed and telling the technology department (or vice versa), the two groups needed to think together about the issues, risks, and opportunities of the digital age” (Karacaoglu, Mocan, and Halsema 2018, 26).

## Bank Group Recognition of Key Issues

- » The Bank Group has emphasized the importance of collaborative work to solve development challenges in the face of emerging disruptions.

The Bank Group FY20–22 Human Resources Strategy recognizes the importance of catalyzing a culture of greater collaboration. It calls for the Bank Group to develop leaders who can mobilize resources across the Bank Group to solve increasingly complex development challenges. Furthermore, it emphasizes that the emerging disruptions require emerging leaders to be integrators and coalition builders and notes that “while technical expertise is critical, new leaders must go beyond individual excellence to contribute collaboratively to a shared purpose to help improve staff engagement and catalyze the WBG [World Bank Group] culture of greater collaboration and innovation” (World Bank 2019l, 12).

The Bank Group’s Mainstreaming paper recognizes the need to improve internal capabilities, including collaboration (World Bank 2019h). It notes that the Bank Group will ensure a coordinated, Bank Group–wide approach for DTT support on several fronts and support knowledge sharing and collaboration.

The Program Document for the World Bank’s 2020 MDDT Initiative refers to insufficient collaboration and coordination in mainstreaming digital and disruptive technology solutions across the Bank Group. High demand for greater collaboration and coordination was expressed in a series of consultations across the Bank Group. These noted that although there are tech initiatives managed by various units at the Bank Group, there is lack of cross-sectoral knowledge sharing and peer-to-peer learning (World Bank 2020d).

The World Bank is working to understand the state and nature of cross-sectoral collaboration. A forthcoming ASA, *The Converging Technology Revolution and Human Capital: Potential and Implications for South Asia*, reports that looking across the Human Development portfolio in all Regions, Human Development in South Asia stands out as the most “internally collaborative” (with joint projects between Education, Health, and Social Protection) (Bashir and others, forthcoming). However, it is also the least “externally collaborative” (with non–Human Development Global Practices), as measured by share of portfolio size either led by one Human Development Global Practice and contributed by others, or led by others and contributed by Human Development Global Practices. The level of collaboration with non–Human Development Global Practices in South Asia has been less than in most other Regions. Furthermore, the ASA points out that

following the COVID-19 onset, pipeline projects under preparation indicate that South Asia Human Development has started to work with Global Practices focused on urban development, social development, and private sector development. But, paradoxically, there is very little collaboration with those Global Practices that could complement investments in technology that promote human capital (for example, Digital Development; Governance; Macroeconomics, Trade, and Investment; Energy; Water; and Agriculture).

## IEG Findings

- » There have been efforts to improve collaboration within the World Bank, and there are some examples of effective collaboration in providing DTT support.

The Bank Group has attempted to improve collaboration for DTT support across Global Practices. For example, in July 2019, the Infrastructure Vice Presidency and the Equitable Growth, Finance, and Institutions Vice Presidency issued a joint memorandum agreeing on a mechanism whereby the Digital Development Global Practice would have coordination responsibility for all digital engagements with the country teams. However, the memorandum did not address leadership and coordination of DTT work, corporate responsibility for which currently lies with a small team housed in the front office of the Infrastructure Vice Presidency (see box 4.1). In July 2019, a new Disruptive Technology Task Force was set up under this team. The Disruptive Technology Task Force comprises one representative from each operational vice presidency and aims to follow up on the Mainstreaming paper by supporting the tracking of corporate priorities, new disruptive technology initiatives, knowledge sharing, and capacity building for staff and clients. New concerns that the internal realignment—which took effect on July 1, 2020, and involves the appointment of regional directors and maps technical staff to Regions—might hinder improved collaboration by recreating old problems of low mobility across Regions and lead to insufficient DTT specialized staff in each Region. The realignment’s effects on collaboration—in terms of quantity and quality—among the various parts of the World Bank will need to be monitored at three levels: (i) among Global Practices within a Practice Group; (ii) among Global Practices across Practice Groups; and (iii) among global directors, regional directors, and country directors.

To further foster DTT work, the 2020 MDDT Initiative proposes improved institutional arrangements. A Network and a Technical Working Group aimed at connecting teams and programs across the Bank Group that are relevant for DTT are to be established. In addition, the Bank Group proposes a Secretariat, housed in the Digital Development Global Practice, to support the Network and the Technical Working Group and implement an initial set of MDDT activities. As the initiative is rolled out and the detailed roles, responsibilities, and activities of the Secretariat in relation to other parts of the Bank Group engaged in DTT work are finalized, the following considerations can help avoid pitfalls and enhance the effectiveness of the Bank Group's DTT work:

- » Ensure that decision-making on DTT-relevant issues for sectors (such as agriculture, education, health, transport, or energy) and/or themes (such as data/development economics, or governance) continues to be made in the unit in which the expertise for that sector or theme lies.
- » Closely monitor the extent to which the proposed institutional arrangement—Network, Technical Working Group, and Secretariat—is addressing the collaboration problem it was meant to solve.
- » Ensure that DTT-relevant issues that cut across sectors, themes, or projects are addressed at the institutional level, rather than on an individual project-by-project basis.
- » Ensure that the involvement of technology companies in the new institutional arrangement is appropriately ring-fenced to avoid compromising the Bank Group's honest broker role and to ensure there is no conflict of interest with regard to, for example, procurement reform.

## Box 4.1. Institutional Arrangements for Digital Technologies and DTT in the World Bank Group

### In the World Bank

In 2020, as part of the Mainstreaming Digital and Disruptive Technologies (MDDT) Initiative, the World Bank Group proposed a Network, a Technical Working Group, and a Secretariat housed within the Digital Development Global Practice, to implement an initial set of MDDT activities.

Prior to the MDDT Initiative, the World Bank's Digital Development Global Practice, housed in the Infrastructure Vice Presidency, had corporate responsibility for "digital engagements" within the World Bank. This Global Practice both provided task team leadership for projects and performed knowledge and coordination functions.

Corporate responsibility for disruptive and transformative technologies (DTT) rested with a small team located in the front office of the Infrastructure Vice Presidency. This group did not provide task team leadership for projects. It played knowledge and coordination roles, mostly through a Disruptive Technology Task Force, which was set up in July 2019 and comprised a representative from each of the operational vice presidencies.

Digital engagements and DTT also form part of the work of the Finance, Competitiveness, and Innovation and Governance Global Practices (and to a lesser degree, the Macroeconomics, Trade, and Investment Global Practice) under the Equitable Growth, Finance, and Institutions Vice Presidency and that of each of the sectoral Global Practices under the Social Development and Human Development Vice Presidencies. Each of these Global Practices provides task team leadership for projects in addition to playing knowledge and coordination roles in their respective sectors.

The Technology and Innovation Lab in Information and Technology Solutions provides support to operational teams engaging in technology-related piloting and innovation. Development Data Partnership (formerly Data Collaboratives), Disruptive Technologies for Development Trust Fund, Geo-Enabling for Monitoring and Supervision, Geospatial Operations Support Team, and Social Development Data Lab are among the other groups in the Bank Group that also deal with digital engagements and DTT and that support operational teams by playing a knowledge function. Staff managing these groups do not provide task team leadership for projects.

*(continued)*

## Box 4.1. Institutional Arrangements for Digital Technologies and DTT in the World Bank Group (cont.)

### In the International Finance Corporation

The International Finance Corporation (IFC) seeks to support DTT through several core units described below. In addition, IFC's mainstream industry departments and advisory functions support DTT interventions.

IFC restructured the DTT practices in fiscal year 2019. Prior to the reorganization, the Telecoms, Media, and Technology teams, fintech teams, and Private Equity and Venture Capital Funds teams were housed in a single department. Since the reorganization, the Telecoms, Media, and Technology group is part of the Infrastructure and Natural Resources Department; the fintech team has migrated to the Financial Institutions Group; and the Private Equity and Venture Capital Funds team has moved to a new Disruptive Technology and Funds group headed by a senior director. This new group aims to better integrate disruptive technologies across IFC through joint ventures and knowledge sharing with other departments.

In addition, the implementation of IFC's Strategy 3.0 involved the creation of new IFC Upstream units in fiscal year 2020. Upstream units were created under each of the industry groups, including for infrastructure and disruptive technology, to support market creation initiatives and pipeline development for IFC. The Upstream units are also expected to be points of interaction with the World Bank.

*Source:* World Bank data and Independent Evaluation Group interviews.

Examples of effective cross-Global Practice collaboration for DTT for development exist. Interviewees pointed to ID4D, GEMS, the Digital CASA program, and the Development Data Partnership (formerly Data Collaboratives). Box 4.2 discusses the collaborative aspects of ID4D (box 2.1 provided ID4D lessons) and the Digital CASA program, and appendix D discusses GEMS and the Development Data Partnership.

In a recent first, the Vietnam country team collaborated with the Bank Group's corporate disruptive technology team (in the front office of the Infrastructure Vice Presidency) to review ongoing and pipeline projects for

DTT opportunities. Ongoing and pipeline projects in the Vietnam country portfolio were examined to check whether technology was already being deployed and whether there were new opportunities to do so. Among ongoing projects, the review identified 35 projects where DTT-relevant opportunities could potentially be harnessed. These 35 projects were in the following sectors: education; energy and extractives; environment and natural resources; health, nutrition, and population; social protection and jobs; transport; and water. The next step would be to seize missed opportunities, and the review has identified specific operations for project-level deep dives. Furthermore, the corporate disruptive technology team has developed a general framework for examining the opportunities and risks of technology adoption in infrastructure operations—a framework that could be examined for possible application to other sectors as well.

#### **Box 4.2.** Cross-Sectoral Collaboration in the ID4D and Digital CASA Programs

The **Identification for Development (ID4D) program**, launched in 2014, reports to a senior directors' group, which includes 10 members who meet regularly to ensure a cohesive and coordinated approach across different sector entry points (for example, financial inclusion, social protection, and gender). The ID4D initiative, led by a program manager and a core team of six full-time staff members, works closely with an extended team of World Bank Group colleagues who are part of a formal cross-sectoral working group, consisting of lead specialists from each of the Global Practices and departments involved (Digital Development; Jobs and Social Protection; Health, Nutrition, and Population; Finance, Competitiveness, and Innovation; Governance; Gender; and Legal), and the Disruptive Technologies and Funds industry group of the International Finance Corporation (IFC). These staff provide a significant focus on ID4D and ensure links to the operational work of the Bank Group. ID4D staff provide critical advice and knowledge to operational teams but are not task team leaders of operations. The ID4D work program was developed with input from sector experts, including the leads from the five Global Practices, the Gender Global Theme group, the Consultative Group to Assist the Poor, and IFC. The initiative includes three pillars: World Bank operations/country engagement, thought leadership and analytics, and global platforms and convening. A ID4D high-level advisory council chaired by a World Bank managing director

*(continued)*

## Box 4.2. Cross-Sectoral Collaboration in the ID4D and Digital CASA Programs (cont.)

and 11 global thought leaders from the private sector and government meets twice a year with the aim of supporting global advocacy and providing a sounding board on emerging issues. In addition, partnerships with donors, the United Nations, and private sector and development partners help leverage one another's strengths and achieve alignment on good practices in ID4D.

The **Digital Central Asia–South Asia (CASA) program** shows the importance of Country Management Units in eliciting multisectoral collaboration within the sectoral governance structure of the World Bank. Within this context, the Country Management Units need to play an essential role to create adequate room and resources for the appropriate integration of digital technologies in the country program. Such Country Management Unit leadership was a key enabler in facilitating the sample of projects in Kosovo and Nicaragua reviewed for this evaluation. Conversely, in another case, the collaborative nature of the project was not sufficiently appreciated and the budget was assigned to one Global Practice, even as key inputs were expected from lead specialists in three different Global Practices; the budget was depleted quickly with no genuine collaboration.

Instead of relying on the usual work program agreement process, which tends to discourage collaboration as teams compete for budgets to cover their own fixed costs, in the Afghanistan Digital CASA project, the practice managers worked together to prepare a team-based budget, distributing the budget according to tasks and costs. Then they compared this distribution against the work program agreement budget to make sure the teams were covered. This allowed the teams to finance a geospatial data specialist to work with several Global Practices and for the Finance, Competitiveness, and Innovation and the Social Protection teams to work together.

The Digital CASA projects in Afghanistan and the Kyrgyz Republic combined public and private sector engagement. The Digital Development Global Practice served as the repository of technological knowledge. The Finance, Competitiveness, and Innovation and the Governance Global Practices provided their experience in the applications of technology, and IFC's Telecoms, Media, and Technology group contributed its experience with information technology and telecoms in the private sector.

*Source:* Document reviews and Independent Evaluation Group interviews.

» Bank Group databases lack sufficient data on collaboration relating to DTT.

Adequate data on internal Bank Group collaboration relating to DTT do not exist, despite the cross-cutting nature of DTT. Existing Bank Group data on cross-support among Global Practices from Bank Group databases, or on collaboration among Global Practices from the Bank Group’s engagement surveys, fall short for the following reasons: (i) there is no official Bank Group list that identifies DTT-related projects and ASA (except for Digital Development or ICT projects and ASA); (ii) disaggregated data on cross-support by Global Practices from Bank Group databases do not provide information on the extent of collaboration specifically in DTT-related projects and ASA; (iii) although the Bank Group’s engagement surveys do capture aspects of collaboration, disaggregations specifically for DTT-related projects and ASA are unavailable; and (iv) in any case, none of the above data say anything about the *nature and quality* of the collaboration in enhancing the outcomes of DTT-related projects and ASA.

» In interviews, Bank Group staff reported that collaboration across Global Practices has been insufficient in scale and scope.

IEG interviews conducted for this evaluation pointed to insufficient DTT-relevant collaboration among the different Global Practices. NVivo analysis of IEG’s interviews of Bank Group staff that are part of the reference population knowledgeable about collaboration and coordination (described in appendix A) found that of the 46 interviewees, 37 (or 80 percent) reported insufficient collaboration in providing DTT support. Of the 29 interviewees who talked about internal structures and collaboration, 23 interviewees (or 79 percent) reported that these had been inadequate to support collaboration. There was a perception among interviewees from across Global Practices that collaboration is insufficient among the different Global Practices, with instances of competition for task team leaderships. Interviewees further observed that ICT may be embedded in many Bank Group projects in a country, but each project team often has its own IT expert; each expert could give different advice regarding data collection and management. The result is that the systems “do not talk to each other.” Interviewees noted that many issues related to budget allocation and recognition arose when two or more Global Practices or vice presidencies were involved in a multisectoral project.<sup>2</sup> Moreover, even in digital economy diag-

nostics, which were intended to encourage collaboration across Global Practices, collaboration problems persist (Hanna 2019).<sup>3</sup>

Previous IEG evaluations have flagged general collaboration challenges within the Bank Group. IEG's *Knowledge Flow and Collaboration* evaluation pointed to a lack of collaboration for integrated solutions at the Bank Group (World Bank 2019g). Furthermore, IEG's evaluation *Support for Innovation and Entrepreneurship* found that the flow of knowledge on innovation and entrepreneurship is limited, especially across networks, sectors, Regions, and the three Bank Group institutions (World Bank 2013).

The World Bank and IFC could play separate but complementary and highly coordinated roles in DTT projects. IFC staff highlighted the importance of the World Bank in persuading governments to implement regulatory changes, while the World Bank needs IFC's investments to incentivize reform on the part of governments. This collaboration works either when the incentives of the two institutions are aligned or in an ad hoc manner largely based on personal relationships among IFC and World Bank staff. The lack of more systematic collaboration is partly due to the discrepancy in the timescales of the two institutions: the regulatory reforms implemented by the World Bank often span a much longer time than IFC's investment projects. In such cases, the two institutions can have separate but complementary roles rather than committing to joint operations. Even with separate roles, ensuring complementarity requires collaboration. This evaluation found that collaboration works when IFC and the World Bank engage upstream even before any lending or investment projects are in the pipeline. Such preengagement was a major factor contributing to the success of the Digital CASA program. Conversely, in DE4A Moonshot/Accelerate, IFC was brought in late in the process, which initially created hurdles, although the teams were eventually able to overcome these. A One World Bank Group approach would also help with funding and data issues relating to areas where IFC is not currently involved (for example, Digital Economy Sandbox funding). Internally in IFC, collaboration remains a work in progress since IFC's realignment of the Global and Regional Mainstream units and the addition of the Upstream units.

Although the DE4A country diagnostics are an example of different Global Practices coming together for a more coherent approach to DTT, they illus-

trate some shortcomings in collaboration. DE4A country diagnostics mainly involve the Digital Development, the Finance, Competitiveness, and Innovation, and the Governance Global Practices. At the review meeting for the initiative, the need for engaging with additional Global Practices such as Macroeconomics, Trade, and Investment and Poverty was noted, but no subsequent action was taken (Hanna 2019, 70).

The lack of systematic collaboration across Global Practices remains an issue for several reasons. The reasons include (i) linking budgets with task team leadership, often resulting in Global Practices lobbying country directors to secure task team leaderships; (ii) holding regional directors and practice managers accountable for ensuring that each of their staff is fully employed and requiring that preset lending volume targets are met; (iii) giving most, if not all, recognition to the task team leader rather than also recognizing co-task team leaders and other team members; (iv) having unclear division of roles and responsibilities for digital technologies and DTT (see box 4.3 for details); and (v) importantly, having a lack of emphasis on the achievement of intended development outcomes.

### Box 4.3. Division of Roles and Responsibilities for Digital Technologies and DTT

Staff interviewed for this evaluation pointed to a lack of clarity with regard to the following issues which, according to them, resulted in unreasonable transaction costs and hampered the efficient delivery of lending and nonlending operations:

- » Although the coordinating role of the Digital Development Global Practice was clear with regard to information and communication technology and digital technologies, there was ambiguity about the role of this Global Practice for coordination and task team leadership when it came to sectoral operations, such as digital agriculture, energy, transport, water, edtech, and e-health.
- » World Bank administrative resources and staff time was taken up with competition for task team leaderships among the Digital Development; Finance, Competitiveness, and Innovation; and Governance Global Practices. Lack of collaboration among different experts ran the risk of inconsistent advice on the same issue by different parts of the Bank Group (such that the systems “do not talk to each other”).

*(continued)*

### Box 4.3. Division of Roles and Responsibilities for Digital Technologies and DTT (cont.)

- » There was insufficient clarity about the role of the Digital Development Global Practice when it came to operations involving disruptive and transformative technologies (DTT) (beyond information and communication technology and digital technologies) such as robotics, artificial intelligence, internet of things, nano-technology and biotechnology, batteries, drones, solar panels, and self-driving vehicles.
- » Interviewees further noted that there was fragmentation of DTT work within the Regions, with the risk of missed opportunities for lesson learning. They suggested regional focal points—similar to gender focal points—as a possible way to help coordinate DTT work within a Region.

*Source:* Independent Evaluation Group interviews.

## Procurement (World Bank Only)

### DTT-Relevant Procurement

In DTT-related projects, procurement can raise specific concerns due to (i) an incomplete understanding (by decision makers, client IT specialists, and World Bank staff) of functional and technical specifications relating to interfaces, protocols, and data structures; (ii) consequent potential difficulties in interoperability across systems and the potential for continued dependence on specific vendors; (iii) potential need for business process reengineering relating to, for example, the conversion from analog to digital data; (iv) potential loss of data ownership and privacy and the commoditization of user data by vendors; and (v) limitations in technology-specific legislation and regulation.

### Bank Group Recognition of Key Issues

- » The World Bank has recognized that procurement is a significant constraint to innovation within the World Bank and that there is also need for continued innovation in DTT-relevant procurement.

According to the Mainstreaming paper, “procurement can play a strategic role in enabling innovation and mainstreaming disruptive technology into Bank operations” (World Bank 2019h, 16). The paper notes the need for continued innovation in DTT-relevant procurement. A 2017 World Bank report found that staff considered procurement to be a significant constraint to innovation within the World Bank, due to long delays that affect the flexibility needed for innovation, and, in particular, difficulties in hiring young firms (World Bank 2017c). These issues are especially detrimental to DTT-related projects.

## IEG Findings

- » Procurement is a major implementation constraint in DTT-related projects in the eyes of most World Bank interviewees.

Staff interviewed by IEG overwhelmingly reported that the World Bank’s procurement systems are not supportive of DTT and constrain the institution’s ability to respond to client needs. NVivo analysis of staff interviews conducted by IEG showed that of the 24 interviewees who talked about procurement systems, 21 interviewees (or 88 percent) reported a lack of DTT-relevant procurement systems conducive to DTT-relevant work. The NVivo analysis is described in appendix A. Interviewees reported that procurement processes do not sufficiently encourage cases where the World Bank or borrower may be unaware up-front of the best solutions available in the market, which is frequently the case with innovative DTT-related projects. For example, regarding procuring services related to AI, clients and the World Bank may not have a priori specifications but may have knowledge only of the problem to be solved. Ideally, vendors would submit their best solutions based on the problem to be solved.

World Bank staff interviewees pointed to trade-offs between helping clients to customize specifications to adapt to present needs and maintaining interoperability with both legacy and future systems. Interviewees pointed to capacity limitations, not only at the level of the borrower but also at the level of World Bank operational and procurement staff, flagging the need to develop ICT procurement skills, encourage principles of innovation, and streamline processes. Because clients typically need software and an after-sale

relationship with the vendor, particular skill is needed to navigate the fine line between customizing specifications on behalf of the client and drawing up specifications that are too generic to be useful. If specifications are too customized, the outcome will tend toward single sourcing, which would put the World Bank in the position of advocating for a single supplier.

Several past IEG evaluations have flagged procurement issues in technology projects. For example, IEG's evaluation *Capturing Technology for Development* reported that ICT procurement was a major constraint for implementation due to the lack of expertise in ICT procurement, the need to separate the procurement of goods and services, inconsistent advice to borrowers, limited borrower capacity, and the lengthy procurement process (World Bank 2011a). Management accepted that procurement was an issue, and procurement guidelines were revised in 2011 to include ICT-specific approaches, procurement methods that reflected the complexities of ICT system design and development, and the review of bidding documents for ICT projects and guidelines for task team leaders. IEG's evaluation *The World Bank Group and Public Procurement* confirmed a series of improvements to ICT procurement, including revisions to the standard bidding documents, acceptance of two-stage bidding, the use of framework agreements for software maintenance or servicing, and other means of flexibility, although legacy difficulties remain (World Bank 2014b). In the following year, IEG's second evaluation on learning and results noted that World Bank staff sometimes lacked the knowledge needed to check whether procurement specifications for high-technology data systems were adequate, making them vulnerable to companies seeking to sell expensive systems that exceeded client needs (World Bank 2015a).

- » IEG's expert review undertaken for this evaluation found that there is currently only fragmented guidance for complex technology projects, specifically on the risks associated with complex technology projects (such as vendor lock-in, lack of interoperability of systems, potential loss of data ownership and lack of data privacy, limitations in technology-specific legislation and regulation, and mismatch between business processes and the requirements of the particular technology).

IEG's expert review of the World Bank's procurement regulations from the perspective of DTT-related operations found that World Bank procurement

regulations and guidance do acknowledge a range of DTT-relevant factors. These include (i) the need for procurement to consider the speed of technological change; (ii) the need for transferability and security of information across past and future systems and across different providers; (iii) the dangers of continued dependency on particular bidders; and (iv) possible constraints on eligible technical solutions due to limited internet access or mobile bandwidth and coverage. The review also referred to the importance of specifying functional over technical requirements and allowing borrowers a wide range of market approaches to procurement, including of new technologies. Although offering a range of selection options and market approaches to procurement, the World Bank's procurement regulations and guidance only offer a generic guide to risk management, which is specific to neither IT nor DTT.

Current procurement guidance has limited relevance for risk factors that greatly influence the success or failure of complex technology projects. These factors include the following:

- » Borrower capacity issues, including technology staff capacity<sup>4</sup>
- » Functional and technical specifications that may not be well understood by decision makers or developers<sup>5</sup>
- » Interoperability, not only with legacy systems but also with potential future directions
- » Business process reengineering, for example converting from analog to digital systems and processes<sup>6</sup>
- » Uncertain costs arising from unclear buyer or supplier transparency of responsibilities or ongoing license or maintenance costs, or both
- » Legal challenges (box 4.4)

Procurement requirements for technology are partly dealt with in the standard procurement documents, but critical aspects are only briefly mentioned, such as process reengineering, the significance of open standards, and systems piloting.

The World Bank does permit the use of two-stage bidding for complex ICT and DTT procurement, for example in cases where the exact solutions are not known up-front. In such cases, unpriced technical proposals are invited, based on performance specifications or on design concepts. Bidding documents may be adjusted based on information acquired during the process. Even this approach may not be sufficiently open ended for certain areas of DTT, such as AI, where it may be possible to specify only the problem to be solved. Electronic-reverse options are another flexibility that has been introduced. In principle, the World Bank also offers a “competitive dialogue” process that allows for wide flexibility.

#### Box 4.4. Legal Challenges in Procurement

One example of legal issues arising in complex technology was the failure to specify ownership and usage rights for an application programming interface in Estonia, leading to litigation years later between the government and the private vendor.

Interviewees pointed out that copyright of applications purchased from the private sector can also lead to downstream legal issues. Moreover, as data become digital, the distinction between content and data blurs, leading to issues of ownership, privacy, and data use.

Country clients also mention possible cross-border legal issues, for example those related to cloud storage of information in servers in other countries or with certain large-scale private data companies. Cloud storage in the United States or elsewhere could be problematic if, for example, political sanctions are imposed that deny countries access to their data or compromise privacy. Storage with some private providers could open the door to questions about the ownership or confidentiality of information. One solution could be that the World Bank advises clients on how to classify their data. Risk-free data (such as that collected from the web) could be given to private company servers, while sensitive information, such as health or security-related information, could be hosted on in-country servers. But data sovereignty issues will need to be resolved.

*Source:* Independent Evaluation Group interviews for the expert review undertaken for this evaluation.

In addition, the World Bank's procurement systems provide some flexibility in the thresholds for bidders' years of experience. This facilitates bidding by relatively young start-ups but may still deny entry to the youngest firms, which could be the most innovative. However, thresholds are needed to safeguard the buyer.

Task team leaders are reluctant to use the available flexibility as this is perceived to add to the time and complexity of an operation. Interviewees attribute the delays and complexity to insufficient guidance on how to apply the available flexibility for complex technology projects in the World Bank's procurement systems in different situations. Providing guidance can encourage project teams to use the available flexibility for complex technology projects.<sup>7</sup> This will require that procurement staff are well versed in the guidance to help ensure that projects proceed smoothly and without undue delay. Reluctance to use the available flexibility may also result from misaligned incentives that encourage risk aversion.

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<sup>1</sup> The six Global Practices would be Governance, Jobs and Social Protection, Education, Poverty, Digital Development, and Finance, Competitiveness, and Innovation. In practice, the Poverty and Finance, Competitiveness, and Innovation Global Practices are not involved in the project at this time.

<sup>2</sup> Normally, the country director only gives the budget to the Global Practices it chooses for task team leadership. If a Global Practice is not providing task team leadership for a project, it cannot show in the system that it is working on a project (it is only shown as “cross-support”).

<sup>3</sup> Hanna (2019) noted that in digital economy diagnostics, a preoccupation with capturing budget has come at the cost of sufficient collaboration, a lack of analytical depth, insufficient attention to the twin goals, and a failure to connect to the analog foundations stressed by the *World Development Report 2016* (World Bank 2016e). He concluded, “The underlying factors for these gaps go beyond having common assessment tools. The current operating model tends to inhibit collaboration and cause fragmentation, internal competition....These gaps are not insurmountable, within the World Bank and in country clients and there are a few encouraging examples. But overall assessment of all pilots suggests there is much room for improvement” (Hanna 2019).

<sup>4</sup> Staff pointed out that the World Bank could better use its convening power to identify specific country risks for different stakeholders.

<sup>5</sup> Technical specifications relate to interfaces, protocols, data structures, system language, and standards that ensure interoperability across vendors, legacy systems, programming languages, data formats, and the like. Efforts should be made to adopt or specify open standards that are approved by recognized standards organizations and available for public use free of royalties. These can help eliminate the problem of being tied to a specific vendor.

<sup>6</sup> Converting analog to digital information to enable numeric analysis will commonly require a review and, often, the overhaul of all systems, processes, methods, rules and regulations, and legislation. Stakeholders often resist this. World Bank staff said that the digitization rate is as low as 30 percent in some client countries where most financial systems are manual and point out that the World Bank can introduce clients to a variety of alternative digitization tools.

<sup>7</sup> Two draft World Bank analytical reports—*GovTech Procurement Strategy* and *Disruptive Technologies in Public Procurement*—are in preparation.

# 5 | Institutional Culture and Incentives for Risk Taking and Innovation

## Highlights

||| The World Bank Group recognizes the importance of institutional incentives and a culture of learning and innovation for achieving a more effective Bank Group and acknowledges risk aversion as an issue.

||| This evaluation found that although harnessing disruptive and transformative technologies for development often demands innovation, which by definition is without precedent and inevitably risky, there were insufficient incentives for staff to take risks and innovate.

||| The levers at the disposal of the Bank Group (such as leadership signaling, questions asked in operational review meetings, and the performance management system) were not yet being effectively used to facilitate informed risk taking and innovation for disruptive and transformative technologies for development.

## DTT-Relevant Risks and Innovation

DTT-related operations are inherently risky and often call for innovative approaches. The riskiness of DTT-related operations results from the many complex reforms that need to be pursued—often simultaneously—and that involve multiple public and private sector stakeholders. This is illustrated by the World Bank’s 2013 Ghana eTransform project, which aimed to improve the coverage and transparency of government service delivery by digitizing several parts of government. This required the project to support significant legislation (such as a data protection act and an electronic transactions act) and regulations (such as for electronic signatures, electronic investigations and interception, electronic payments medium, and electronic waste). Furthermore, upgrading the country’s biometric ID system was essential for facilitating electronic transactions and called for sophisticated and innovative management information systems for the proper handling of citizens’ personal data. In addition, collaboration with the private sector was required to set up medical call centers to provide a first-response mechanism to citizen inquiries about medical and health care issues in remote and rural parts of the country. Finally, the success of the project also depended on procuring computer hardware and software and ensuring affordable high-speed internet access.

More recently, the COVID-19 pandemic has brought into stark relief DTT-relevant risks and the need for innovation. The Organisation for Economic Co-operation and Development–World Bank team collaborating to use DTT to aid the COVID-19 response points out that “the use of new technologies to cope with COVID-19 creates a fundamental tension between the opportunities brought by digital tools and the risks that the use of data pose to privacy rights and security” (Amaral, Vranic, and Lal Das 2020). Almost overnight, the pandemic disrupted the centuries-old model of “children going to school,” requiring it to be blended with “schools going to children,” and thereby forcing public and private sector organizations to instantly step up to deliver innovative DTT solutions for learning, including in situations of low capacity and connectivity.

## Bank Group Recognition of Key Issues

- » The Bank Group has acknowledged the existence of risk aversion as a constraint for innovation and the need for a culture change in favor of a new learning culture, especially in the context of the changing nature of work.

The Bank Group’s FY20–22 Human Resources Strategy states that incentivizing behaviors that create a more effective, results-oriented, innovation-driven culture are key to achieving a more effective Bank Group. Drawing on the technology-related discussion of the changing nature of work in the *World Development Report 2019* (World Bank 2019m), the Bank Group’s Human Resources Strategy emphasizes learning agility and conscious on-the-job learning over mastery (World Bank 2019l). Recognizing the need for a culture change, the strategy emphasizes that the new learning culture aims to treat learning as a journey rather than an event and places increased focus on innovation and results.

A 2017 World Bank report recognizes that there are barriers to innovation and that there is risk aversion at the World Bank (World Bank 2017c). About half of the interviewees for the 2017 report opined that there would be negative professional consequences if innovative elements failed and that often management did not sufficiently recognize innovative projects due to their small size. The same report also notes that certain task team leaders argued that they were evaluated, measured, and promoted based on their outputs or disbursements rather than on results, impact, and learning. Furthermore, according to the report, although some interviewees discussed how their managers were happy to recognize their staff if they successfully used innovative methods, and others discussed how managers can provide support when navigating the World Bank’s bureaucracies, most management support to enable innovation appeared to come in the form of “not impeding” their teams (World Bank 2017c).

## IEG Findings

- » There are a few instances of greater risk appetite.

The West Africa Unique Identification for Regional Integration and Inclusion Program is an example of the World Bank demonstrating greater risk appetite. This is a 10-year operation in six countries—Côte d’Ivoire, Guinea

(Phase 1); Benin, Burkina Faso, Niger, and Togo (Phase 2)—and the Economic Community of West African States Commission to build foundational ID platforms that are regionally interoperable. As such, the program faces technical risks (data privacy and data security), policy risks (weak implementation that could lead to further marginalization of vulnerable populations), and organizational risks (cooperation with external organizations such as the Economic Community of West African States and coordination within the World Bank). To manage these risks, a director-level mechanism was established within the World Bank to review periodically the project’s risk management actions. The World Bank also employed an agile multiphase programmatic approach, under which countries could join when they were ready. The World Bank deemed the potential benefits of providing social assistance to vulnerable groups in West Africa to be greater than the risks.

» In general, however, Bank Group staff interviewees perceived a lack of sufficient institutional incentives for risk taking and innovation.

IEG interviews of Bank Group staff cited the institutional culture and incentives for risk taking and innovation as challenges for DTT support. NVivo analysis of staff interviews conducted by IEG showed that of the 41 interviewees who talked about incentives for DTT support, 37 interviewees (or 90 percent) reported these to be insufficient. Of the 19 interviewees who talked about incentives for risk taking, 18 interviewees (95 percent) reported these to be insufficient. Furthermore, of the 23 interviewees who talked about incentives for innovation, 18 interviewees (78 percent) reported these to be insufficient. The NVivo analysis is described in appendix A.

A past IEG evaluation found that staff experience pressure to avoid risks. An IEG survey and interviews conducted for IEG’s first Learning and Results evaluation found that staff experienced pressure to avoid risks and not to admit failure and that in the view of many, there was limited learning from mistakes (World Bank 2014a). That evaluation also found that staff perceived the lack of institutional incentives to be among the biggest obstacles to learning and knowledge sharing in the World Bank. Moreover, the World Bank’s internal organizational structure has been subject to many reforms, but serious reforms of internal incentives have not been undertaken.

Interviewees noted that the willingness to attempt innovative solutions for the twin goals depends on an institutional culture that supports risk taking and acknowledges that failure is part of this. Failing is essential, because if one is not “prepared to be wrong,” one will never produce “anything original” (Robinson 2009). Interviewees noted that incentives to learn from mistakes would require that the Bank Group convey clearly and explicitly how failure would be treated. Every project document in the Bank Group is required to discuss potential risks and mitigation measures, but interviewees reported that the “real” risks are sometimes downplayed so as not to hold up the operational review process. The implicit assumption staff make is that the institution has a low tolerance for risk and failure. Ensuring a more realistic up-front assessment of risks would require staff to feel psychological safety in speaking up about potential risk and failure and for operational review meetings to also promote speaking candidly about them. Google X holds meetings termed “premortems,” where teams are encouraged to speak their mind from the start about all the things that could go wrong. This enables decision makers to be fully aware of risks and make calculated bets. Furthermore, projects that are expected to fail are not viewed negatively: “We see killing projects as a normal part of doing business because it means we can go faster and take on ideas that are more promising” (Teller 2016).

» Interviewees reported that the Bank Group's institutional incentives do not yet sufficiently encourage staff to keep up with DTT trends, despite the fluid and fast-moving nature of DTT.

Interviewees reported a lack of institutional incentives for staff to keep up with DTT trends. An institutional barrier cited in the interviews was that Bank Group staff were not encouraged to keep up with technological advances to enable them to deploy frontier DTT for development. Interviewees reported a lack of active support and enthusiasm for DTT-related external training, secondment of staff to and from organizations leading in DTT, encouragement of participation in relevant conferences, and partnership with external organizations that are pioneers in specific DTT areas.

Interviewees saw the Bank Group treating DTT in the same way as other sectors and themes, with little awareness that DTT are fluid and fast moving. World Bank interviewees in the Digital Development and the Finance, Com-

petitiveness, and Innovation Global Practices and in IFC said that leadership did not provide sufficient incentives for innovation and smart risk taking. Such incentives are especially needed in DTT-related operations since the Bank Group needs to move with greater agility (by reducing processing complexity) compared with traditional infrastructure sectors. Interviewees noted that IFC is often the last to sign deals, which can be a particular issue in a fast-moving area such as DTT.

Although IFC and the World Bank tend to take more risks in venture capital investments in DTT and fintech projects than in more traditional projects, their risk tolerance is still below that of other players in the area. Risk aversion is apparent in broad managerial comfort with what has been tried before rather than something that breaks new ground. In DTT, and fintech and digital entrepreneurship specifically, there are often no past examples, but interviewees confirmed managerial preference for precedents even in these areas. Nevertheless, interviewees noted that there is a marked increase in risk appetite for venture capital investments in DTT and fintech projects compared with a couple of years ago.

- » Interviewees reported that the Bank Group was not making the best use of its levers to create incentives for risk taking and innovation and that pilots were insufficiently monitored, precluding the expansion of successful initiatives or the scaling back of unsuccessful ones.

The levers at the disposal of the Bank Group (such as leadership signaling, questions asked in operational review meetings, and the performance management system) were not yet being effectively used to facilitate informed risk taking and innovation for DTT for development. The organizational effectiveness literature suggests that leading on an overarching agenda typically requires a strong mandate and signaling delivered from the top.<sup>1</sup> The housing of Singapore's Smart Nation program in the prime minister's office is a case in point (Lin 2016). Interviewees saw the operational review process as constraining innovation and creative solutions, given the general support for continuing on a familiar path rather than for breaking new ground. Interviewees reported that legal, procurement, and external relations departments often asked for precedents and could not always be counted on to support first-time initiatives. Furthermore, interviewees reported that the

operational review meetings did not consistently ask questions focused on informed risk taking, learning from successes and failures, and innovation for DTT for development. Interviewees also noted pressure to lend, saying that it took a lot to be at the cutting edge and that it was easier to just keep things simple. Interviewees noted that some innovation occurs despite the system. As one interviewee put it: “There are fearless innovators. . . . It takes a lot of self-motivation.” Other interviewees noted that a lot of innovation is being driven by intrapreneurs, but they are not being fully supported. There is tremendous pressure for them to conform to more traditional paths and ways of operating. Economist Gary Pisano identifies a number of behaviors necessary for creating a culture of risk taking and innovation (appendix F).

The Bank Group has supported pilots for innovation, but the systematic monitoring of pilots, which can allow subsequent upward or downward scaling, is not sufficiently undertaken in the Bank Group. Pilots for innovation are supported through three initiatives: (i) the Disruptive Technologies for Development Fund, which finances pilots that are proposed by Bank Group staff and connects them to experts within and outside the Bank Group; (ii) the ID4D Mission Billion innovation challenge to source innovation for providing digital ID for vulnerable groups; and (iii) the Development Marketplace (gender-based violence). However, interviewees noted that there has been insufficient monitoring of the pilots supported through these three mechanisms and, consequently, insufficient follow-up. The Bank Group’s stated goal of “thought leadership on what is changing, why it matters, and where the new opportunities lie” (World Bank 2019h, iii) would suggest greater emphasis on research and development, piloting, incubation, evaluation, and the scaling of new ideas. In this regard, the Bank Group could explore “sandboxing” and “real-life” piloting in addition to the initiatives noted above. Sandboxes can allow Bank Group teams to temporarily waive procedures in particular areas to freely experiment, affording staff the psychological safety to innovate, take calculated risks, and fail without fear of repercussion. Real-life piloting can allow new approaches to be implemented in different country contexts where there are willing clients, enabling innovation to be scaled quickly, taking it from the “lab to the last mile” (Watkins 2018). Even when pilots are well monitored and suggest potential for scaling, challenges may arise. Disruptive technologies in the energy sector, such as

the Bank Group’s experience with Lighting Global (which includes Lighting Africa and Lighting Asia) and Scaling Solar, were covered in a recent IEG evaluation and are discussed in appendix K.

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<sup>1</sup> For example, the United Kingdom’s Department for International Development notes that a well-networked central hub “will ensure coordinated implementation of the digital strategy. It will set strategic direction for digital policy and programming; build digital capability and capacity; inspire transformation through visible digital demonstration; and ensure impact is maximised through partnerships and collaborative working with those who share our digital vision” (DFID 2018). Similarly, the 2018 United Nations survey on frontier technologies for sustainable development found that having a central hub group was important to success (United Nations Department of Economic and Social Affairs 2018). The United States Agency for International Development has its Global Development Lab, and Singapore has the Government Technology Agency and the Smart Nation Programme Office, which is charged with building innovation capabilities and mindsets across the entire public service. It is housed in the Public Service Division, a central human resources agency under the prime minister’s office. These technological innovation hubs inside of organizations provide links among actors within their innovation systems.

# 6 | Moving Forward: Directions of Travel

## Highlights



The Independent Evaluation Group presents directions of travel for the Bank Group's consideration:



Mining development data generated through disruptive and transformative technologies (DTT) to create even greater social value; leveraging the Bank Group's honest broker role in advising clients, especially on DTT risks; and using explicit corporate metrics to track the implementation of the Bank Group's DTT Mainstreaming approach.



Enhancing Bank Group capabilities to address the differential gender effects of DTT, beginning with advisory services and analytics.



Fostering a growth mindset among Bank Group staff to adapt to the rapidly changing technological landscape, and applying foresight and anticipation to proactively foresee DTT opportunities and identify looming threats, enabling the Bank Group to regroup and take on challenges in real time and thrive even in markedly changed circumstances.

IEG presents—for the Bank Group’s consideration—directions of travel, including examples of each, that can help the Bank Group move forward in strengthening its preparedness for DTT for development.

## Building on the Bank Group’s Existing Strengths

**Mining DTT-generated development data to create even greater social value.** The Bank Group is in a unique position to ramp up the deployment of DTT in the generation, analysis, and use of development data in achieving the twin goals. According to Fu (2019), “High quality development data is the foundation for meaningful policy-making, efficient resource allocation, and effective public service delivery.” DTT elements such as mobile phones, electronic transactions, and satellites have led to an explosion of data that are collected and analyzed cost-effectively, with high frequency, and at fine levels of granularity (Goldberg 2020). This granularity can allow for the personalization of services, for example tailoring learning to individual student needs in poor rural areas and potentially reducing high dropout rates. The *World Development Report 2021* on data offers an opportunity to explore how DTT can revolutionize public and private data collection, analysis, and use and better inform policy making for addressing the twin goals (World Bank 2021). Furthermore, the recently established (managing director-level) Data Governance body and its supporting (vice president-level) Data Governance Steering Committee, which aim to provide executive leadership, oversight, and support for data-related matters, can boost the World Bank’s ability to generate even more social value from (DTT-generated and analyzed) development data. Optimizing the use of public and private data—those made available by DTT but also those that can be analyzed more effectively by using DTT—can help the Bank Group become a data-driven organization.

**Leveraging the honest broker role by advising clients, especially on DTT risks.** The Bank Group’s perceived neutrality positions it well for flagging DTT risks. Fieldwork for this evaluation found that country clients expressed a desire for greater Bank Group advice on DTT risks such as job losses, lack of privacy, and data breaches.<sup>1</sup> Attention to DTT risk is particularly important in ID4D systems, which are especially vulnerable to inadvertent data

spills or willful misuse.<sup>2</sup> Another area of risk is the fragmentation of digital data across different proprietary system silos within government. The Bank Group should help prevent vendor lock-in and improve government efficiency and transparency while speeding up innovation in the public sector.<sup>3</sup> Where a local tech ecosystem exists or is nascent, Bank Group DTT support can strengthen this and use it as an opportunity to foster inclusive growth and job creation. Addressing DTT risks and adhering to the do no harm principle may require the Bank Group to navigate sensitive ethical and political issues and advise clients on such issues.<sup>4</sup> AI governance—ensuring that AI is explainable, transparent, and ethical—is critical.<sup>5</sup> Ethical issues are also prominent in the use of personal data and vaccine distribution, for example.<sup>6</sup> After due vetting, the Bank Group could use its convening power to bring together relevant experts in areas where it may lack the necessary technical expertise to help clients mitigate DTT risks.<sup>7</sup>

**Using explicit corporate metrics to track the implementation of the Mainstreaming approach.** The DTT Mainstreaming approach applies across Bank Group institutions, Global Practices, and Regions. Explicit metrics—defined at the corporate level—can help track progress and enable timely course corrections, thereby facilitating learning and the successful implementation of the Mainstreaming approach. Two Bank Group initiatives—the work on Gender and the Human Capital Project—may provide lessons for the mainstreaming of the DTT agenda.

## Enhancing Bank Group Capabilities That Are Not Yet Its Forte

**Addressing gender-differential impacts of DTT, beginning with ASA.** The Bank Group’s 2015 Gender Strategy highlighted gender gaps in the use of technology and women’s lower participation in technical jobs and technical occupations (World Bank 2015b). It notes these gender gaps were often due to off-line factors like poverty, gender discrimination, and gender stereotypes that prevent girls and women from benefiting from digital technologies. At the same time, increased access to credit, knowledge, and markets made possible by DTT may place women at higher risk for domestic violence (McDougal and others 2019; see appendix C). Analysis of gender and DTT for this evaluation found that although 76 percent of the 51 World Bank ICT projects (ICT sector

percentage weight of 50 percent or more) approved during FY15–19 had one or more gender-relevant flags, just 37 percent had all three gender flags. Of particular concern was that just 7 percent of the 90 World Bank ICT ASA initiated during FY15–18 were gender relevant—a particular concern since it is in ASA that new opportunities to address the gender-differential impacts of DTT can be explored. Beyond gender considerations, it will be important to ensure that other excluded groups (such as the LGBTQ community, people with disabilities, ethnic and religious minorities, and displaced communities) benefit from the opportunities of DTT and are protected from its risks.

## Developing New Strengths

**Fostering a growth mindset among Bank Group staff.** Given the uncertainties created by technological shifts, the Bank Group could enhance its preparedness for DTT by ensuring a growth mindset that promotes continuous learning and adaptation among its staff. Dweck (2006) explains that leaders of organizations that possess a growth mindset constantly try to improve by setting out to hire highly capable staff, endeavoring to learn from their own mistakes and shortcomings, and addressing openly the skills that they and the company will need for future success. In this way, continuous learning becomes part of the organization’s culture. IEG’s first Learning and Results evaluation noted that organizations that do not learn, die (World Bank 2014a) and pointed to the need for the World Bank to embrace learning and adaptation. Box 6.1 shows how Microsoft fosters a growth mindset.

**Systematically applying foresight and anticipation to help inform and guide the Bank Group’s future support of DTT for development.**<sup>8</sup> Foresight and anticipation can help the Bank Group to proactively foresee DTT opportunities and identify looming threats for the organization, its operations, and its clients (appendix E provides details). As new players enter the DTT for development field, the Bank Group will need to dynamically build new areas of comparative advantage even as it maintains specific old ones. Foresight and anticipation can enable organizations to regroup and take on challenges in real time and thrive even in markedly changed circumstances. For example, Galloway (2020) notes that the landscape of higher education will change “seismically” in the wake of big technological companies entering education during the COVID-19 pandemic,

seeking to expand enrollment by offering hybrid online–off-line degrees. The Bank Group can use foresight and anticipation to help clients adjust in a timely way to such developments. Thinking systematically about tomorrow and being prepared is particularly important in the face of rapid change and uncertainty (Conway 2015; Pauwels 2019; van de Pol 2017).<sup>9</sup> A forthcoming ASA, *The Converging Technology Revolution and Human Capital: Potential and Implications for South Asia*, notes that the World Bank needs to undertake “normative technology foresight exercises” (Bashir and others, forthcoming).

### **Box 6.1.** Hit Refresh: Concrete Actions Taken by Microsoft to Acquire a Growth Mindset

**Old Microsoft.** By 2014, the Microsoft that CEO Satya Nadella had inherited was fading toward irrelevance as the technology industry shifted from desktop computers to smartphones.

**New CEO's vision.** In July 2015, seizing on the ideas in Carol Dweck's book *Mindset: The New Psychology of Success*, Nadella sought to forge a culture change at Microsoft such that staff would believe that “everyone can grow and develop; potential is nurtured, not predetermined; and anyone can change their mindset,” and that they would shift from being “know-it-alls” to “learn-it-alls.”

Microsoft followed up this vision with several concrete actions, including the following:

**Concrete action #1: CEO issuing monthly videos on his top learnings.** Nadella has taken to issuing monthly videos reviewing his top few learnings. This has prompted groups within the company to review their learnings too.

**Concrete action #2: closing meetings with a reflection.** Nudges and small reminders engage all 125,000 of Microsoft's employees with the new culture; for example, leaders close meetings with a reflection, asking questions such as, Was this a growth mindset or fixed mindset meeting? Why or why not?

**Microsoft today.** Microsoft is once again a magnet for top engineering talent, rated as one of five best artificial intelligence companies for employees, and Nadella has a Glassdoor employee approval rating of 95 percent.

*Source:* Adapted from Ibarra, Rattan, and Johnston 2018.

Specifically, applying foresight and anticipation to identifying three sources of uncertainty and risk can help guide the Bank Group's DTT support (UNDP Global Centre for Public Service Excellence 2018):

- » “Known knows” (where it is known that something will change and, at least to an extent, what will change; for example, it is known that the nature of jobs will change, and it is also known that routine jobs will be lost to automation), requiring the Bank Group to anticipate the changes and ensure complete preparedness to be able to address them as soon as they occur.
- » “Known unknowns” (where it is known that something will change, but the nature and extent of change is unknown; for example, it is known that new skilled jobs will be created, but what is unknown is the net change in the total number of jobs due to technological advances), requiring the Bank Group to anticipate, constantly monitor, plan for possible scenarios, and adapt to the evolving scenario as further information becomes available.
- » “Unknown unknowns” or “black swan events” (where events cannot be foreseen, and therefore their nature and scale are also unknown) requiring the Bank Group to develop strong organizational foundations by investing in a growth mindset such that it can regroup, learn, and adapt with agility.

Foresight and anticipation are not completely new to the Bank Group. The Bank Group's CPF is an anticipatory document that outlines the Bank Group's country strategy four to six years out. More specifically for DTT, the recent exploration of foresight and anticipation by the Bank Group's Technology and Innovation Lab is a promising step.

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<sup>1</sup> One possible avenue to explore in addressing job losses and income inequality is universal basic income (see Gentilini and others 2020).

<sup>2</sup> So far, the Bank Group’s attention to DTT risks appears inadequate. IEG received a list of 24 Identification for Development projects and 32 Identification for Development ASAs approved during fiscal years 2010–20. Of the 24 projects, 16 had at least one keyword (*privacy, security* (including cybersecurity, data security), *foundational, surveillance, governance* (data governance), *ownership* (data ownership), and *risk*) in the project abstract, objectives, components, or indicators as per the analytics run by the IEG team. A further desk review to remove false positives identified 12 (50 percent) out of 24 projects with relevant keywords. Similarly, of the 32 ASAs, 21 had at least one keyword in the objective or activity summary. A further desk review to remove false positives identified 16 (50 percent) out of 32 ASAs with relevant keywords.

<sup>3</sup> Goh, Kaiser, and Wright (2020) emphasize the importance of promoting open-source software.

<sup>4</sup> A forthcoming ASA, *The Converging Technology Revolution and Human Capital: Potential and Implications for South Asia*, notes that the World Bank needs to operationalize a theory of do no harm when it comes to technology risks (Bashir and others, forthcoming). A further DTT risk pointed out by Abdalla and Abdalla (2020) is that Big Tech (similar to Big Tobacco) may co-opt academic research. They note that avoiding conflict of interest between Big Tech and its funding of academic work is vital. They advocate deeper discussion of the appropriateness and trade-offs of accepting funding from Big Tech and imposing necessary limitations and conditions on this funding.

<sup>5</sup> Gasser and Almeida (2017) note the information asymmetries that exist between the developers and users (government and consumers) of artificial intelligence.

<sup>6</sup> Pate (2020) notes that “we cannot afford to let high-income countries monopolize the global supply of COVID-19 vaccines, as happened during the 2009 influenza A/H1N1 pandemic.”

<sup>7</sup> Some organizations working on DTT risks include Center for Humane Technology, AI for Good, the Institute of Electrical and Electronics Engineers, and the Stanford Institute for Human-Centered Artificial Intelligence. A 2020 docudrama film, *The Social Dilemma*, aims to raise awareness of the opportunities and risks of the rise of social media.

<sup>8</sup> The evaluation does not advocate any particular brand for analyzing foresight or anticipation. The evaluation sees a critical role for looking ahead and for the Bank Group not to be blindsided or caught off guard by technological developments or changes in country contexts. Some tools for conducting foresight and anticipation include foresight analysis, horizon scan-

ning, scenario planning, and drivers and trends impact analysis (Conway 2015; Pauwels 2019; van de Pol 2017).

<sup>9</sup> The importance of foresight and anticipation is evident in the remarks of a technological entrepreneur: None of us should be focused on the current quarter because that quarter was “baked three years ago.” We need to be thinking right now about the quarter that will reveal itself in three years (Investment Masters Class 2018).

# 7 | Conclusion and Recommendations

## Conclusion

This evaluation sought to answer the question, **How well prepared is the Bank Group to help clients harness the opportunities and mitigate the risks posed by DTT?** The answer to that question is, **Given the accelerating pace and complexity of technological change, the Bank Group is not yet sufficiently well prepared, despite some areas of strength.**

The Bank Group's traditional areas of strength are what have enabled its DTT support. The Bank Group has a commanding reputation for supporting global public goods, a support that now also extends to DTT. Furthermore, the Bank Group's honest broker role has enabled the Bank Group to provide clients with technical expertise, especially in policy and regulatory matters related to DTT. The Bank Group is perceived as a neutral voice advising on different technological solutions. In addition, the Bank Group's ability to offer quality ASA has equipped it with actionable recommendations to support clients in putting their digital economies on a robust footing. Finally, the Bank Group's ability to mobilize trust funds and IDA grants and credits has also enabled its DTT support.

Many areas vital to the Bank Group's preparedness for DTT are, however, either still in development or developing too slowly to match the accelerating technological change occurring in every field. The Bank Group has given increased attention to the digital economy in country diagnostics and strategies, but the discussion in SCDs has not always carried over into CPFs. Although the CPF cannot be expected to address all the constraints identified in the SCD, it would be important to ensure that the CPF's prioritization and selectivity are well justified. There has also been insufficient effort in SCDs in linking the support for digital technologies to the broader development agenda, including the twin goals (for example, when identifying key

constraints). Furthermore, the newly introduced digital economy diagnostics focus on a narrow agenda with room to consider the broader development agenda and the twin goals.

The Bank Group’s strategic documents emphasize the need to invest early in twenty-first century skills and the *World Development Report 2019* notes that, in view of the changing nature of work, lack of education is likely to be one of the strongest mechanisms for transmitting inequalities from one generation to the next (World Bank 2019m). The Bank Group’s top corporate initiatives in education—the Human Capital Project and the Learning Poverty initiative—spotlight necessary skills such as literacy and numeracy. The Bank Group has an opportunity to spotlight twenty-first century skills and move the narrative from a focus on necessary skills to also include twenty-first century sufficient skills such as advanced cognitive skills, digital literacy, and socioemotional skills, in particular a growth mindset or the ability to “learn to learn” and adapt. Both necessary and sufficient skills are critical for ensuring that a workforce is well prepared for the future labor market. There are strong reasons for imparting these skills simultaneously—not sequentially—from early childhood, recognizing the profound positive effect on brain development and lifetime capabilities. Imparting sufficient skills may also serve (i) the nascent demand from developing countries that are aspiring to grow and catch up by becoming knowledge-intensive economies and (ii) reduction of the North-South divide (UNESCO 2015).

The Bank Group’s FY20–22 Human Resources Strategy presents key insights about the staffing issues that confront the Bank Group (World Bank 2019l). Reflecting the latest thinking in organizational psychology, it recognizes the need to build new staff skills and expertise and foster a growth mindset for continuous learning in the face of rapid technological change. The Bank Group has yet to (i) identify the DTT-relevant skills that it needs; (ii) ensure that its information systems and databases contain the necessary information on its current DTT-relevant skills; and (iii) take action to fill any gaps. Bank Group staff noted in interviews that the number of existing staff with DTT-relevant skills is insufficient to meet client demand, especially in areas such as regulatory reform, data privacy, cybersecurity, 5G networks, and AI, and, consequently, staff with these skills are often overstretched. They also

reported that mindsets for continuous learning and adaptation in the Bank Group fall short of what is needed.

Despite the cross-cutting nature of DTT, there was a perception among interviewees from across Global Practices that collaboration was insufficient among the different Global Practices, with instances of competition for task team leadership. There was also insufficient collaboration between the World Bank and IFC, even though DTT typically require the public and private sectors to work together.

Furthermore, interviewees noted that procurement was a major constraint to the smooth implementation of DTT-related projects. There is only fragmented guidance for complex technology projects, specifically on the risks associated with such projects (such as vendor lock-in, lack of interoperability of systems, potential loss of data ownership and lack of data privacy, limitations in technology-specific legislation and regulation, and mismatch between business processes and the requirements of the particular technology). There is also insufficient guidance on how the flexibility available for complex technology projects in the World Bank's procurement systems can be applied in different situations. In addition to insufficient guidance, misaligned incentives may contribute to the reluctance to use the available flexibility.

Harnessing DTT for development often demands innovation, which by definition is without precedent and inevitably risky. However, interviewees reported that DTT were treated in the same way as other sectors or themes, despite their fluid and fast-moving nature, and that relevant staff were not encouraged to keep at the cutting edge of technological advances and DTT trends. Furthermore, the levers at the disposal of the Bank Group (such as leadership signaling, questions asked in operational review meetings, and the performance management system) were not yet being effectively used to facilitate informed risk taking and innovation for DTT for development. Interviewees saw the operational review process as constraining innovation and creative solutions, given the general support for continuing on a familiar path rather than for breaking new ground. Interviewees reported that legal, procurement, and external relations departments often asked for precedents and could not always be counted on to support first-time initiatives.

Finally, IEG presents—for the Bank Group’s consideration—directions of travel (including examples under each) that can help the Bank Group move forward in strengthening its preparedness for DTT for development. These include (i) building on the Bank Group’s existing strengths (by, for example, mining DTT-generated development data to create even greater social value, leveraging the honest broker role by advising clients especially on DTT risks, and using explicit corporate metrics to track the implementation of the Mainstreaming approach); (ii) enhancing Bank Group capabilities that are not yet its forte (by, for example, addressing the gender-differential effects of DTT, importantly in ASA); and (iii) developing new strengths (by, for example, fostering a growth mindset among staff to adapt to technological change and applying foresight and anticipation to proactively foresee and address DTT opportunities and challenges).

## Recommendations

This evaluation makes three recommendations:

**Recommendation 1: Where DTT offer opportunities to make progress on the twin goals more effectively or efficiently, ensure that the Bank Group avails itself of those opportunities and addresses, in particular, the risks posed by DTT.** This will entail, for example:

- » Systematically identifying in both country diagnostics and digital economy diagnostics the opportunities and risks posed by DTT for achieving the twin goals;
- » Consistently asking in operational review meetings (from Concept Note to approval and implementation stages) whether and how the use of DTT in operations can bring (or is bringing) effectiveness and efficiency gains in addressing the twin goals; and
- » Strengthening cross-sectoral linkages and synergies between DTT and sectoral issues, including through enhanced collaboration across Global Practices and between the World Bank and IFC, particularly where different units support technological solutions with the same client.

Where appropriate, a complement to country and digital economy diagnostics could be a review of ongoing and pipeline projects for DTT opportunities, such as the one undertaken recently in Vietnam.

**Recommendation 2: Build a Bank Group workforce with the skills required to harness DTT opportunities and mitigate DTT risks by identifying DTT-relevant skills, determining gaps in these skills, and filling these gaps.** This will entail:

- » New recruitment of staff or consultants to fill specific skills gaps, retraining of existing staff, outsourcing, secondments, external partnerships, or a combination of these;
- » Ensuring a more efficient use of the skills of available specialized staff and a better bridging of technology expertise with that of sector specialists and task team leaders; and
- » Supporting a growth mindset for continuous learning as noted in the Bank Group's FY20–22 Human Resources Strategy.

**Recommendation 3 (World Bank only): Improve the effectiveness and efficiency of World Bank procurement for complex technology projects.** This will entail, for example:

- » Strengthening procurement guidance for staff and borrowers, for early-stage project scoping, as well as subsequent capacity development, on the identification, prioritization, and mitigation of the risks associated with complex technology projects. The guidance could cover: availing of existing flexibilities for complex technology projects such as two-stage bidding; monitoring the extent to which World Bank staff teams adopt these flexibilities; and institutionalizing arrangements for technology project management.
- » Ensuring that teams benefit from effective and efficient innovation while protecting the World Bank and the borrower from procurement-related reputational risks.
- » Preparing a roster of the world's leading experts on the procurement of complex technology projects and encouraging market consultations on technical requirements in the preparation of bidding documents.

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# APPENDIXES

Independent Evaluation Group

*Mobilizing Technology for Development*



# Appendix A. Methodological Approach

## Evaluation Question

The evaluation sought to answer the following question, How well prepared is the World Bank Group to help clients harness the opportunities and mitigate the risks posed by disruptive and transformative technologies (DTT)?

Thus, the evaluation’s focus was on the Bank Group’s preparedness to support clients rather than on an assessment of the effectiveness of Bank Group support to clients based on ex post evaluation methods and metrics or the Bank Group’s adoption of technology for its own internal information technology systems.

## Concept of Disruptive and Transformative Technologies

The evaluation adopted the broad concept of DTT in line with the 2018 and 2019 Development Committee papers (World Bank 2018, 2019b [the latter henceforth called the “Mainstreaming paper”]). The Mainstreaming paper states that disruptive technologies can be defined as emerging technologies that “result in a step change in the cost or access to products or services, or that dramatically change how we gather information, make products, or interact” (World Bank 2019b, iv). The Mainstreaming paper outlines five corporate priorities for mainstreaming the Bank Group’s approach to disruptive technologies: (i) country diagnostics; (ii) agile regulation; (iii) digital connectivity; (iv) digital government services; and (v) skills and capabilities for the new economy and the role of education. The Mainstreaming paper also adds sectoral and regional programs and programmatic approaches to the five corporate priorities. The Bank Group’s approach to DTT is discussed in more detail in appendix B.

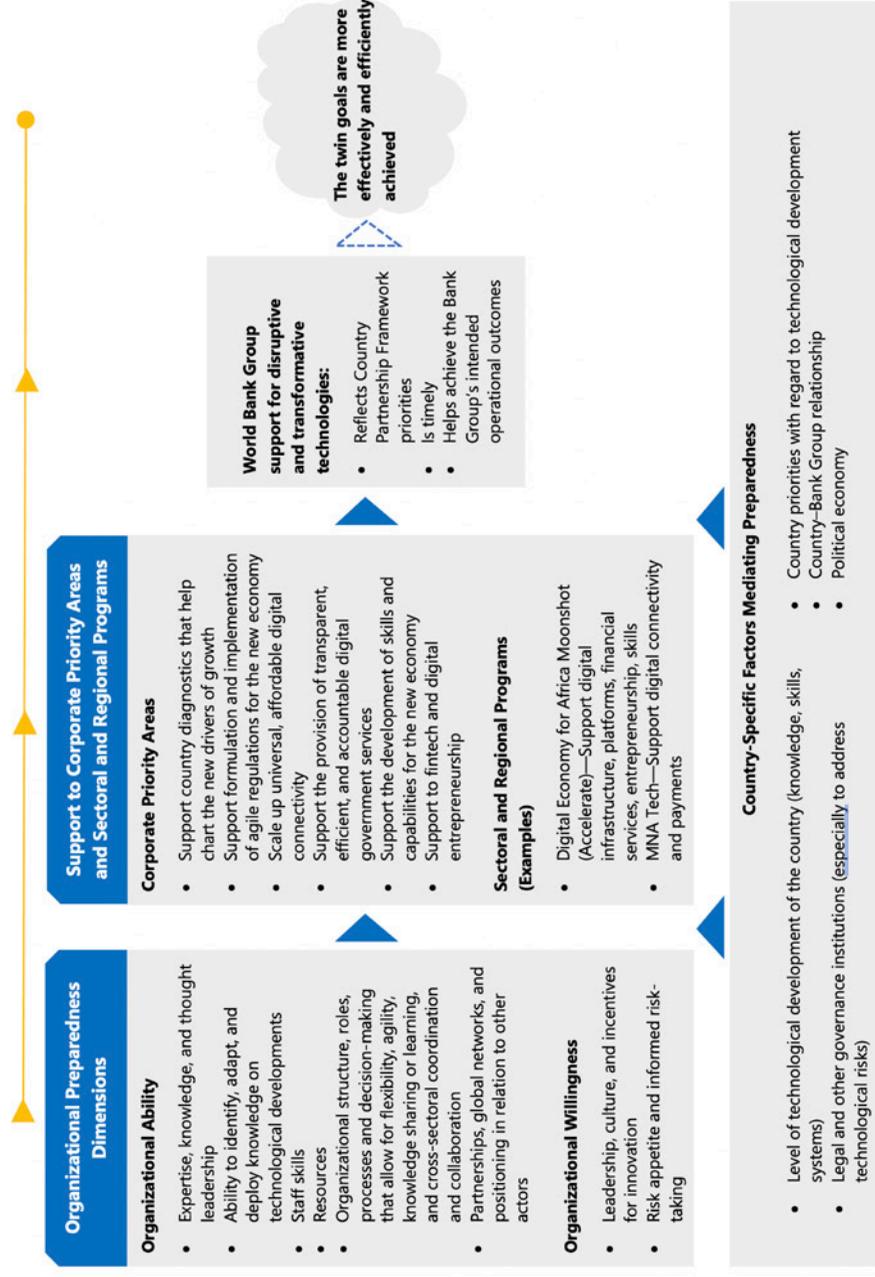
The evaluation is aligned with the concept and scope of DTT introduced in the Mainstreaming paper. Accordingly, in addition to digital technologies, it covers support to new and existing technologies (and their use) and the enabling policies, institutions, and skills and the lending and nonlending operations with significant DTT components or that are a response to the implications of DTT. In particular, the evaluation examined the preparedness of the World Bank and the International Finance Corporation (IFC) in each of the five Bank Group corporate priorities and their preparedness with regard to sectoral and regional programs for mainstreaming DTT. It also reviewed fintech and digital entrepreneurship, whose relevance for the DTT approach was highlighted in the Bali Fintech Agenda. The Challenges section in this appendix discusses issues arising from the Bank Group's definition of DTT.

## Overarching Principles

Apart from the concept of DTT, two central principles motivated the evaluation design. First, the evaluation was grounded in a conceptual framework to assess the Bank Group's preparedness to help clients harness the opportunities and mitigate the risks posed by DTT, based on the preparedness dimensions emerging from the organizational effectiveness literature and relevant Independent Evaluation Group (IEG) evaluation findings. These dimensions are critical for organizations to adjust under conditions of uncertainty.

The IEG team constructed the conceptual framework (figure A.1) through an iterative process with the IEG methods team and validated it with key stakeholders. Second, the evaluation followed a mixed-methods approach, combining a range of methods for data collection and analysis, and applied systematic triangulation to ensure the robustness of the findings.

Figure A.1. Framework for Analysis



Source: Independent Evaluation Group; Development Committee papers (World Bank 2018, 2019b); organizational effectiveness literature.  
 Note: MNA = Middle East and North Africa.

# Evaluation Components

Table A.1 lists the evaluation components. The rest of the section provides more detail on each component and how it relates to the thematic reviews undertaken by IEG for the Bank Group’s DTT corporate priorities. The section that follows it provides details on how the validity of the findings was ensured. The last section delves into the challenges faced by this evaluation.

**Table A.1.** Evaluation Components

Evaluation Component	Description
Literature review	Several reviews were undertaken: (i) literature relating to disruptive technologies and their effects; (ii) literature on organizational effectiveness; (iii) existing IEG evaluations; (iv) Bank Group documents on technology and innovation; and (v) policy papers from other development institutions.
Document and database review	A review of (i) the Bank Group’s information systems and databases in the five corporate priorities, as well as fintech and digital entrepreneurship, and (ii) selected sectoral and regional programs. Review of project documents for a purposive sample of World Bank and IFC operations for corporate priority reviews in digital connectivity, digital government services, and fintech and entrepreneurship. Extensive review of all DTT-related ASA interventions in education and gender and of SCDs and CPFs for countries referred to in the Mainstreaming paper (World Bank 2019b).
Assessment of staff skills	A collaborative effort between IEG and DEC to assess the extent of Bank Group preparedness with regard to staff skills to help clients harness the opportunities and mitigate the risks posed by DTT.
Semistructured interviews	Semistructured interviews of 105 Bank Group staff, including staff and managers at headquarters and in country offices.
Qualitative analysis using NVivo	Qualitative analysis of the 105 semistructured Bank Group staff interviews based on a coding protocol and keyword search to extract information on staffing, internal collaboration, and incentives (the findings are presented in relevant chapters of this report).
External stakeholder interviews	Interviews with 57 clients and external stakeholders, including government officials, staff in nongovernmental organizations, private sector stakeholders, other donor agency staff, and researchers.

Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; CPF = Country Partnership Framework; DEC = Development Economics Vice Presidency; DTT = disruptive and transformative technologies; IEG = Independent Evaluation Group; IFC = International Finance Corporation; SCD = Systematic Country Diagnostic.

## Literature Review

The evaluation conducted a literature review to (i) understand and conceptualize the impact of DTT on inclusive development, including the interrelationships among disruptive technologies, digital technologies, the digital economy, and inclusive development; (ii) identify the key dimensions of organizational effectiveness, particularly as they pertain to DTT; (iii) explore the Bank Group’s preparedness to address DTT through reviewing past strategies, policy papers, analytical internal World Bank documents, and relevant IEG evaluations; and (iv) review the experience of development organizations relating to DTT, especially in distilling good practices for dealing with change, uncertainty, innovation, and risk, based on reports and policy documents from other development partners, including the Organisation for Economic Co-operation and Development, United Nations, International Monetary Fund, UK Department for International Development, United States Agency for International Development, consulting firms, and the scholarly literature from academia and think tanks.

## Document and Database Reviews

The document and database review was conducted on two levels: (i) corporate level to allow for an assessment of the organizational enablers and constraints for harnessing opportunities and mitigating risks posed by disruptive technologies and (ii) intervention level to draw conclusions about the Bank Group’s current preparedness based on a purposive sample of interventions in the corporate priorities, weighted toward more recent interventions. On the corporate level, the review of documents included Bank Group country and regional diagnostics, program documents (for example, Digital Economy for Africa Moonshot/Accelerate), and IEG higher-level evaluations. The database review covered Bank Group databases, such as for human resources, budgets, skills mix, incentives, and rewards (covered in the respective chapters of this report). For interventions, relevant Bank Group documents were reviewed: (i) all advisory services and analytics (ASA) for education and gender for the past five years (support to skills and capabilities and education is one of the five corporate priorities, and Gender is a Bank Group Global Theme—details are presented in appendix C); (ii) selected

project documents for China, India, and Vietnam as part of country validation visits; and (iii) project approval, supervision, and closing or evaluation documents, as well as IEG evaluations for selected projects in digital connectivity, digital government, and fintech and digital entrepreneurship. The review of documents and databases was used to distill contextualized findings from case-based analysis on both the corporate and intervention level to illustrate specific dimensions of preparedness and to explore the Bank Group's comparative advantage in DTT.

## Assessment of Staff Skills

IEG and the Development Economics, Development Data Group collaborated to assess the extent to which the Bank Group was prepared with regard to its staff skills to help clients harness the opportunities and mitigate the risks posed by DTT. To do so, IEG and the Development Economics Vice Presidency examined the Bank Group's taxonomy and definitions of staff skills, together with relevant data from SkillFinder, People Profile pages, staff curriculums vitae, human resources, and other institutional sources. The assessment also examined the Bank Group's Communities of Practice and Yammer groups since these would conceivably offer an insight into how many staff were sharing their interest or experiences in working on DTT.

## Semistructured Interviews of Bank Group Staff

Semistructured interviews included the following stakeholders: (i) World Bank staff in Global Practices, Regions, country offices, and IFC; (ii) in-country stakeholders, such as Bank Group clients, government, and the private sector through selected country visits and remote interviews of stakeholders in selected Bank Group projects (discussed further in the External Stakeholder Interviews section in this appendix); and (iii) donors, partner agency staff, and private sector stakeholders. The purpose of the semistructured interviews was to gain insights into what Bank Group staff, clients, and external stakeholders perceived as organizational enablers and constraints within

the Bank Group for harnessing opportunities and mitigating risks posed by disruptive technologies.

## Qualitative Analysis Using NVivo

Qualitative analysis was conducted using NVivo qualitative data analysis software of interviews of 105 Bank Group staff (including task team leaders or investment officers, managers, and directors from Global Practices or IFC departments and Country Management Units) in headquarters and country offices (tables A.2 and A.3). The team formulated a coding scheme to identify views expressed on each of the following issues: staffing, internal collaboration, and incentives (which reflect three chapters in this report). The coding scheme consisted of three levels of codes: first-level codes (parent codes) and second- and third-level subcodes (child codes). The team then used the coding scheme and keywords identified for each code to analyze the interviews. The team consulted with sectoral experts to ensure that the keywords captured the language and terminology they used for DTT-related topics. Finally, the team analyzed the codes using NVivo features like cross-tabs and matrix coding to evaluate the responses. The interviewees were categorized by their position title—whether they were staff or management (directors and managers). The complete coding information for the NVivo analysis can be found in table A.8 in this appendix.

**Table A.2.** Interview Respondents by Position Title

Title	Count	Percent
Nonmanagerial staff	86	82
Managers (directors + managers)	19	18
Total	105	100

Source: Independent Evaluation Group.

**Table A.3.** Interview Respondents by Location

Location	Count	Percent
Headquarters	58	55
Country office	47	45
Total	105	100

Source: Independent Evaluation Group.

## External Stakeholder Interviews

The evaluation team engaged with external stakeholders on several levels. First, the team interviewed a wide array of stakeholders, including government officials, staff in nongovernmental organizations, private sector stakeholders, other donor agency staff, and researchers to supplement the literature review in assessing (i) the impact of DTT on inclusive development, including the interrelationships among disruptive technologies, digital technologies, the digital economy, and inclusive development, and (ii) the perceived role of the Bank Group at the nexus of technology and development. Second, the interviews of external stakeholders also aimed to (i) determine the extent and nature of client demand for Bank Group support for disruptive technologies and (ii) identify organizational good practices in specific areas that the Bank Group can benefit from and enablers for beneficial partnerships with external organizations or companies.

Thus, the team conducted in-person interviews during three country validation visits (in India, China, and Vietnam) to triangulate its findings. It also conducted remote client interviews related to intervention-level analysis for projects in digital connectivity, digital government services, and fintech and digital entrepreneurship. This ensured better triangulation of the findings per corporate priority and allowed the team to reach a *point of theoretical saturation* with the number of interviews it was able to conduct. This point was reached after an iterative process of triangulation between interview findings and findings from desk reviews until additional interviews did not add any new perspectives or cast any doubts on the triangulated findings. In some cases where a point of saturation was not reached (for example, due to

low numbers of interviews or high levels of divergence across interviews), the team took this into account in the formulation of findings (by using more tentative language) or decided that not enough evidence was available to assess a particular issue.

## DTT Corporate Priority Reviews

The team conducted thematic reviews in the five corporate priorities identified in the Mainstreaming paper (World Bank 2019b) and in fintech and digital entrepreneurship. The thematic reviews were conducted based on a combination of the components discussed in the previous section. The templates and protocols for conducting the document reviews, semistructured interviews, and qualitative analysis using NVivo are included in this appendix (tables A.5–A.11), and some of the projects reviewed for the intervention-level analysis are listed in tables A.12–A.15.

### Corporate Priority 1: Country Diagnostics

Preparation of the Country Diagnostics thematic review involved, first, a review of the Systematic Country Diagnostics and Country Partnership Frameworks for Morocco, Poland, and Senegal (all three countries were showcased in the Mainstreaming paper); second, a review of the Digital Economy Diagnostics paper produced for the Digital Development Global Practice; third, a review of approaches to country benchmarking, assessing the new digital business indicators and relevant lessons from the *Doing Business* series of studies; and, fourth, interviews with five World Bank staff working on country and digital economy diagnostics to extend IEG’s review of documents, which formed the main analysis in determining the links between country diagnostics and the twin goals.

### Corporate Priority 2: Agile Regulation

Preparation of the agile regulation thematic review involved, first, an extensive review of academic and think tank literature from outside the Bank Group; second, two separate searches of the Bank Group database: identifying all lending projects and ASA marked as digital markers for fiscal years (FY)15–19 using keywords approved by the Global Practices, and identifying

projects and ASA listed in Image Bank for FY19 using the terms *digital* and *regulat*; third, a detailed examination of project documents to examine progress with regulatory reform in a series of West and Central African telecoms projects; and, fourth, interviews of 11 Bank Group staff and (for bioengineering) staff from the International Food Policy Research Institute.

### Corporate Priority 3: Digital Connectivity (World Bank and IFC)

The assessment of the Bank Group’s preparedness to scale up universal affordable digital connectivity included a literature review, review of World Bank and IFC corporate databases, review of project documents, staff interviews at the corporate and project level, and interviews of internal stakeholders. IEG selected a purposive sample of 50 interventions to include different modalities of support and geographic diversity (25 in each of the World Bank and IFC). The list of projects is available in tables A.12 (World Bank) and A.13 (IFC). The sample included both ASA and lending operations. For the World Bank, the sample was drawn from a list of operations provided by the Digital Development Global Practice and identified from Business Intelligence, comprising operations approved between FY11 and FY19 that either were led by the Digital Development Global Practice or included a significant component of the digital development theme. The sample included completed and evaluated interventions, mature interventions (with at least one Implementation Status and Results Report or progress report on file) and recent approvals. IEG oversampled more recent approval years to account for the evolving nature of Bank Group support. IEG then interviewed a selection of the World Bank’s senior managers, corporate partners, 10 of the task team leaders involved with the selected sample of projects, and 8 client counterparts. For IFC, the team looked into the four digital infrastructure “verticals” supported by IFC: mobile network operators, shared infrastructure (that is, towers), data centers, and broadband. IEG interviewed IFC managers, corporate partners, and 10 investment officers involved with the selected sample of projects.

## Corporate Priority 4: Digital Government Services

The priority review of the World Bank’s readiness to support the provision of transparent, efficient, and accountable government services focused on support to digital ID as one of the key disruptive technologies that enable access to services and development opportunities. The review examined how digital IDs either catalyzed or interacted synergistically with related services to allow transformative interventions in World Bank operations. Since social protection services were the most frequent (although not the only) users of digital ID systems, the review focuses mainly on the adoption of digital technologies in social protection programs. The assessment of the World Bank’s readiness included a literature review, a review of project and program documents, and semistructured interviews of managers and task team leaders in three Global Practices (Digital Development, Jobs and Social Protection, and Governance) and the Identification for Development program. IEG selected a purposive sample of six operations involving digital systems for Identification for Development and/or the delivery of social protection services from a universe of 18 relevant operations approved between FY12 and FY20 identified from World Bank documents and staff interviews. Four operations were in the Sub-Saharan Africa Region and one each in the Middle East and North Africa and South Asia Regions. The desk review was complemented by 12 semistructured interviews (including the task team leaders for the reviewed operations, managers, and Identification for Development program staff).

## Corporate Priority 5: Skills Development and Capabilities (Education)

Preparation of the education thematic review involved, first, an extensive review of academic and think tank literature from outside the Bank Group; second, a review of education projects and ASA approved during FY15–19 that were DTT-related (the methodology is described in detail in the next paragraphs and in tables A.9–A.11 of this appendix); third, a review of key Bank Group documents on the Human Capital Project; and, fourth, interviews of EdTech fellows and World Bank staff in the Education Global Practice.

Since the World Bank does not maintain a list of DTT-related projects and ASA in education, IEG identified these in collaboration with the Education Global

Practice. The relevant projects and ASA had at least one DTT-relevant objective, component, or indicator (or discussion) that met the following criteria:

1. They “applied” DTT to *improve education* (for example, by using computers in the classroom).
2. They used education to “respond” to DTT to prepare people for a world disrupted by DTT by imparting twenty-first century skills, such as (i) *developing or producing* DTT (for example, by teaching advanced cognitive skills, including higher-order problem solving and creative thinking); (ii) *using or consuming* DTT (for example, by teaching digital literacy); (iii) preparing people for new jobs in which *humans have the comparative advantage* (for example, by teaching socioemotional skills, including empathy, curiosity, intrinsic motivation, grit, communication, teamwork and collaboration, leadership, global awareness, self-regulation, conflict resolution, relationship management, and, in particular, a growth mindset or the ability to “learn to learn”—to be lifelong learners and to adapt to change).

The evaluation team identified 217 keywords (see table A.10) based on a structured literature review and World Bank and IEG reports (see table A.9 for documents reviewed) and consultation with education experts in the Global Practice. The evaluation team then conducted a multiple keyword search using R analytics on all 163 lending projects and 403 ASA approved in the past five fiscal years (FY15–19), identifying 119 lending projects and 332 ASA with at least one keyword. The evaluation team then conducted a desk review of the 119 projects and 332 ASA using a coding protocol (see table A.11). The desk review screening resulted in 57 lending projects and 62 ASA, which were validated with education experts in the Global Practice (table A.4).<sup>1</sup>

**Table A.4.** Education and DTT-Related Lending Projects and ASA Identified

Product	Total (approved FY15–19)	Projects and ASA after Keyword Search	Projects and ASA after Desk Review
Projects	163	119	57
ASA	403	332	62

Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; DTT = disruptive and transformative technologies; FY = fiscal year.

# Fintech and Digital Entrepreneurship (World Bank and IFC)

For this assessment of the Bank Group’s preparedness in fintech and digital entrepreneurship, the IEG team selected, after consultations with managerial and operational staff from the Finance, Competitiveness, and Innovation Global Practice and the Fintech and Payments unit at IFC, a purposive sample of 23 interventions. The sample included both lending or investment operations and analytical work approved between FY11 and FY18, covering different modalities of support and geographic diversity (the list of projects is in table A.15). IEG then conducted document reviews and semistructured interviews of 10 staff based on a standardized template (table A.7) and several clients and donors of the same interventions. The inputs and additional information obtained from the literature review were used to complete the standardized template (table A.6) and produce a background paper, whose findings fed into the chapters of this report.

## Ensuring the Validity of Findings

IEG took several steps to ensure a consistent approach across evaluation team members, for example using interview templates and protocols to ensure a common framework and evaluative lens across studies. Similarly, IEG secured interrater reliability across team members charged with coding interview transcripts. Furthermore, the team applied triangulation at multiple levels, first by cross-checking evidence sources within a given methodological component. Within the thematic reviews, for example, the team compared and contrasted evidence from interviews (used in the NVivo qualitative analysis) with project document reviews, reviews of strategies and policy notes, previous IEG evaluations, and interviews of external stakeholders, such as clients. In addition, the team applied triangulation across evaluation components to ensure a multitude of independent references, for example cross-validating findings from the thematic reviews for each of the corporate priorities (which included semi-structured interviews and document and database reviews) with the literature review, interviews of clients and donors during country validation visits, and remote intervention-level client interviews.

The evaluation team also applied external validation mechanisms at various intervals during the evaluation process. For example, the team identified activities to review and staff to interview through an iterative process in dialogue with staff involved in DTT. The team also organized workshops with key Bank Group stakeholders at the beginning of the evaluation process to validate the scope and the approach, and at the end to ensure the relevance and feasibility of the evaluation recommendations.

Ensuring the validity of findings for the analysis of collaboration and coordination included the following five factors:

- » **Reference population.** The reference population for the collaboration analysis was Bank Group staff with an informed view on DTT and collaboration, rather than all Bank Group staff. Although the exact number of staff in the reference population was not known, IEG deemed 45 interviews to be an appropriate number in absolute terms.
- » **Strategic selectivity.** The strategic selectivity exercised in identifying the interviewees added to the validity of the findings. The 105 interviewees, of whom 45 expressed an opinion on collaboration, were selected using the following criteria: (i) those with corporate responsibility for digital development and DTT, including those involved in preparing the two DTT Development Committee papers; (ii) those working both at the corporate or strategic level of Global Practices and at the level of implementing DTT lending and nonlending operations (covering relevant staff, task team leaders, investment officers, practice managers, country directors, regional directors, and Global Practices directors); (iii) those managing World Bank-wide DTT networks or initiatives (for example, Geo-Enabling for Monitoring and Supervision, Geospatial Operations Support Team, Development Data Partnership, and Technology and Innovation Lab in Information and Technology Solutions); and (iv) champions or experts on specific DTT topics (for example, regulatory reform or socioemotional skills).
- » **Convergence level.** Of the 46 interviewees who expressed an opinion on collaboration, 37 interviewees—or 80 percent—reported “insufficient collaboration,” which indicates a high degree of convergence.

- » **Triangulation.** Triangulating with Bank Group corporate reports, notably the FY20–22 Human Resources Strategy (World Bank 2019c) and the Mainstreaming paper (World Bank 2019b)—both of which have acknowledged the need for greater collaboration with respect to emerging technologies and DTT—added to the validity of IEG’s findings from the interview data. Several IEG evaluations have also pointed to the need for greater collaboration within the Bank Group, two specifically with regard to work on technology. IEG’s evaluation *Capturing Technology for Development* highlighted the importance of institutional coordination for the information and communication technology agenda, recommending “building incentives mechanisms for collaboration, coordination, and joint approaches for innovation between Bank Group units, reflecting the thematic nature of ICT [information and communication technology]” (World Bank 2011, xvii). It also noted the need for supporting “cross-sectoral enablers, including... policies and standards that would apply across agencies... to effectively lead the ICT [information and communication technology] agenda across sectors” (World Bank 2011, xviii). IEG’s evaluation *Support for Innovation and Entrepreneurship* found that the flow of knowledge on innovation and entrepreneurship was limited, especially across networks, sectors, Regions, and the three Bank Group institutions (World Bank 2013). More recently, IEG’s evaluation *Knowledge Flow and Collaboration* found that general collaboration issues still affect the work of the Bank Group (World Bank 2019a). Furthermore, the *World Development Report 2016* on digital dividends emphasized the importance of analog complements such as policies, institutions, and skills, which inevitably require collaboration across sectors (World Bank 2016). Externally too, the literature points to collaboration challenges relating to DTT across other public and private organizations, suggesting that the present evaluation’s finding of the lack of sufficient collaboration within the Bank Group is not an outlier.
- » **Review of the qualitative interview data.** Beyond the NVivo analysis, the interview data provided a wealth of experiential insights into the nature of collaboration challenges, including illustrations, that added further validity to IEG’s findings on collaboration. For example, interviewees observed that technology and DTT may be embedded in many Bank Group projects in a country, but each project team often has its own information technology expert, and each expert could give different advice regarding data collection and management. The result was that the systems do not communicate with each other.

## Challenges

Notwithstanding these steps, the evaluation faced the following challenges relating to design and methodology that broadly fell into three categories. The first set of challenges were the result of definitional or conceptual issues (see the Concept of Disruptive and Transformative Technologies section in this appendix). The definition of DTT used in the Mainstreaming paper (World Bank 2019b) discussed at the beginning of appendix A under the section “the Concept of Disruptive and Transformative Technologies” does not define the magnitude of the step change that makes a technology qualify as disruptive and does not also define *transformative*. The Bank Group lacks an operationally relevant definition to clearly distinguish projects it considers disruptive or transformative versus those that it does not. As such, there is no authoritative list distinguishing disruptive from nondisruptive interventions, beyond individual interventions that are referenced in the Mainstreaming paper as examples of DTT.

The second set of challenges was the result of conscious choices about scope, and the third set of challenges was due to other methodological and data availability issues. Challenges in scope mostly resulted from the choice to evaluate the Bank Group’s preparedness (as opposed to effectiveness) given the newness of the Mainstreaming approach and lack of sufficient data on outcomes. Although the conceptual framework used in this evaluation was not designed to allow for an assessment of outcomes and intended impacts of the Bank Group’s new approach, it did yield insights on the extent to which the Bank Group is prepared to deliver on the DTT corporate priorities. Finally, Bank Group data related to DTT preparedness (such as on staff skills, collaboration, procurement, and institutional culture and incentives) are, at best, incomplete, requiring IEG to draw on staff interviews. As noted, in cases in which a point of saturation was not reached due to low numbers of interviews or high levels of divergence across interviews, the team took this into account in the formulation of findings (using more tentative language) or decided that not enough evidence was available to assess a particular issue.

Given these challenges, the evaluation team drew on the Mainstreaming paper and crowdsourced information from Bank Group staff to identify and validate DTT engagements and to review and distill findings for this evalua-

tion. The team also conducted careful analysis based on standardized templates, document reviews, and NVivo analysis.

## Templates and Protocols

Tables A.5–A.11 contain the templates and protocols for conducting the corporate priority reviews, and tables A.12–A.15 list the sampled projects selected for reviews relating to digital connectivity, digital governance, and fintech and digital entrepreneurship.

**Table A.5.** Outline for Corporate Priority Reviews

Outline	Source
<b>1. Introduction</b>	
1.1 World Bank Group's rationale for identifying and engaging in this theme; IEG's rationale for inclusion of the theme in the evaluation	Mainstreaming paper
1.2 Based on the literature and World Bank and IFC diagnostic work, what are the key issues related to the theme? (i) What are the main disruptive or transformational technologies with implications and opportunities for the corporate priority, program, or cross-cutting area? (ii) What is the impact of the application of the technology on key stakeholders? Consider private sector, consumers, workers, government, society, and different social and income groups. (iii) (How) has the Bank Group been involved in the development or adoption or adaptation of the technology or technologies? (iv) What are other key players or partners offering assistance in this corporate priority? Briefly explain their roles.	Literature review and document reviews (internal/external), interviews (corporate level)
<b>2. Evolution of Bank Group support to disruptive technologies in the selected theme</b>	
2.1 Summary of the evolution of Bank Group corporate strategies and objectives with respect to (disruptive) technologies in the selected priority	Corporate/sector strategies/mainstreaming
2.2 Description of the focus of Bank Group interventions in support of this corporate priority (such as type of interventions, evolution over time) including financing, ASA, trust-funded activities, pilots, partnerships, and other initiatives	Databases (Business Warehouse), interviews
2.3 Alignment of World Bank or IFC support over the past six years (FY14–19) and pipeline with the corporate priority? (Relevance)	Document reviews—intervention templates, TTL interviews

(continued)

Outline	Source
<b>3. Bank Group preparedness (in responses, differentiate between different country or client contexts such as IDA countries versus IBRD, FCV; and reflect the views expressed by different stakeholders such as TTLs, Bank Group management, CMUs, Bank Group partners, clients, and beneficiaries, where applicable)</b>	
3.1 Areas of demand for Bank Group support to assist clients in the corporate priority? (Consider different income levels, country contexts)	Document reviews—intervention templates, TTL interviews
3.2 Areas in which the World Bank has been responding to client demand effectively	Intervention templates, interviews
3.3 Organizational enablers that have helped the World Bank or IFC to respond effectively?	Intervention templates, interviews
3.4 Areas in which the World Bank or IFC has been unable to respond to demand?	
3.5 Organizational factors that have constrained the response?	
3.6 Conclusions regarding preparedness dimensions in the corporate priority:	
Leadership, culture, and incentives for innovation	
Risk appetite and informed risk taking	
Expertise, knowledge, and thought leadership	
Staff skills	
Resources	
Instrument mix	
Organizational structure, roles, and processes	
Ability to identify, adapt, and deploy knowledge	
Partnerships and global networks and positioning versus other actors	
Attention to cross-cutting issues and implications (jobs, gender, inclusion, fragility)	Intervention templates, interviews
Attention to cross-sectoral issues and complementary investments in, for example, skills, physical infrastructure, business environment, governance	Intervention templates, interviews
<b>4. Conclusions and implications for World Bank or IFC preparedness</b>	Intervention templates, interviews
4.1 Emerging conclusions and implications on how well prepared the World Bank and IFC are in helping clients harness the opportunities and manage the risks in this corporate priority? Ways to enhance its preparedness.	

Source: Independent Evaluation Group.

Note: This template was used for the corporate priority thematic reviews on digital connectivity (for both the World Bank and IFC), digital government services, and fintech and digital entrepreneurship, which relied on intervention-level reviews (document reviews, interviews of World Bank staff, and interviews of clients and donors) and not on country validation visits as noted in the section External Stakeholder Interviews in this appendix. ASA = advisory services and analytics; CMU = Country Management Unit; FCV = fragility, conflict, and violence; FY = fiscal year; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; IEG = Independent Evaluation Group; IFC = International Finance Corporation; TTL = task team leader.

**Table A.6. Intervention-Level Review Template**

Desk Review of (Name of Intervention)		
<b>Intervention data</b>		<b>Project ID</b>
Activity title:		Country:
Type of activity:		TTL(s):
Approval/start date:		Closing date:
Borrower/client counterparts:		
Partnerships involved with this activity (with donors, private sector, CSOs):		
World Bank Group funding/type (IDA/IBRD/TF) at appraisal ( <i>\$ millions</i> ):		Actual Bank Group disbursement to date: ( <i>\$, millions</i> )
Borrower/client funding at appraisal ( <i>\$ millions</i> ):		Actual client disbursement to date: ( <i>\$, millions</i> )
Partner/cofinancier funding at appraisal ( <i>\$ millions</i> ):		Actual partner disbursement to date: ( <i>\$, millions</i> )
Overall development objective(s):		
Disruptive/transformational technology-specific objective(s):		
<b>Relevance</b>	<b>Explanation</b>	<b>Rating</b>
Rating scale: high, substantial, modest, negligible		
1: To what extent is activity aligned with corporate priorities and sectoral programs highlighted in the Mainstreaming paper?		
1.1: Support country diagnostics that help chart the new drivers of growth?		
1.2: Support formulation and implementation of agile regulations for the new economy?		
1.3: Scale up universal, affordable digital connectivity?		
1.4: Support the provision of transparent, efficient, and accountable digital government services?		
1.5: Support the development of skills and capabilities for the new economy?		
1.6: Improve gender equality and create inclusive markets for women?		
1.7: Address development challenges in fragile and conflict contexts?		

(continued)

Desk Review of (Name of Intervention)		
1.8: Brokering technology solutions through sectoral programs (for example, fintech, digital entrepreneurship)		
<b>Implementation status and results (from latest ISR)</b>	<b>Explanation</b>	<b>Rating</b>
Rating scale: highly satisfactory, moderately satisfactory, satisfactory, moderately unsatisfactory, unsatisfactory, highly unsatisfactory		
2.1: Progress toward achievement of PDO		
2.2: Overall implementation progress		
2.3: Overall risk rating		
<b>Systematic operations risk ratings tool (from latest ISR)</b>	<b>Explanation</b>	<b>Rating</b>
Rating scale: high, substantial, moderate, low		
3.1: Political and governance		
3.2: Macroeconomic		
3.3: Sector strategies and policies		
3.4: Technical design		
3.5: Institutional capacity		
3.6: Fiduciary		
3.7: Environment and social		
3.8: Stakeholders		
3.9: Other		
<b>Interview</b>		
Name:		
Position:		
Date of interview:		
Interviewer(s):		
1: How does this intervention relate to the Bank Group approach to DTT articulated in the Mainstreaming paper and/or as implemented by your Global Practice/Country Management Unit/unit?		
2: When and in what way did the (country) client(s) approach the Bank Group about this activity? Why did they approach the Bank Group?		
3: To what extent has the Bank Group been able to respond to this client request in a full and timely manner?		
4: Which organizational enablers have helped the Bank Group respond effectively to this request?		

(continued)

## Desk Review of (Name of Intervention)

5. To which areas of the (original) client request has the Bank Group been unable to respond? Why? Which organizational factors have constrained its response?

6. What recommendations do you have for the Bank Group to better support clients in this area?

### Interviewer's Concluding Thoughts on Preparedness Dimensions

Preparedness dimension	Explanation	Rating
------------------------	-------------	--------

Rating scale: high, substantial, modest, negligible, N/A

» Leadership, culture, and incentives for innovation		
» Risk appetite and informed risk taking		
» Expertise, knowledge, and thought leadership		
» Staff skills		
» Resources		
» Instrument mix		
» Organizational structure, roles, and processes		
» Ability to identify, adapt, and deploy knowledge		
» Partnerships, global networks, and positioning versus other actors		

**Emerging implications** on how well prepared is the Bank Group to help clients harness the opportunities and mitigate the risks posed by disruptive technologies?

Sources of information:

Additional information needed/Issues to be followed up during interviews of Bank Group staff, client representatives, or country case studies:

*Source:* Independent Evaluation Group.

*Note:* CSO = civil society organization; DTT = disruptive and transformative technologies; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; ISR = Implementation Status and Results Report; N/A = not applicable; PDO = project development objective; TF = trust fund; TTL = task team leader.

**Table A.7. Semistructured Interview Questionnaire: Corporate-Level Preparedness for DTT**

1. Please highlight your key points of engagement with the World Bank Group's work on DTT (including, with the "response" to DTT, for example, through education, social protection, or inclusive development, as relevant). Kindly refer us to
  - (i) main documents, including Bank Group documents and external ones;
  - (ii) main interventions, including good practice interventions and interventions where the Bank Group learned from failure.
2. Stepping back, what would the features of an organization that is a world leader in "technology for development" be? (for example with regard to staff skills mix, processes, incentives, organizational structure, and so on). Are there any distinctive features of DTT (magnitude of change, pace of change, and so on) make specific organizational features desirable?
3. Which organization do you consider the world leader in "technology for development"? Where does the Bank Group rank? (at the top, near the middle, at the bottom)
4. Which key organizational enablers or strengths within the Bank Group have enhanced its preparedness with regard to DTT? How?
5. Which key organizational constraints or weaknesses within the Bank Group have reduced its preparedness with regard to DTT? How?
6. Overall, how well prepared is the Bank Group to help clients to harness the opportunities offered by DTT?
  - (i) Very well prepared
  - (ii) Well prepared
  - (iii) Somewhat prepared
  - (iv) Barely prepared
7. Overall, how well prepared is the Bank Group to help clients to mitigate the risks posed by DTT technologies (for example, job losses, global monopolies, rising inequality, cybersurveillance, security, privacy, fake news, algorithmic biases, and so on)?
  - (i) Very well prepared
  - (ii) Well prepared
  - (iii) Somewhat prepared
  - (iv) Barely prepared
8. What are the specific areas of comparative advantage of the Bank Group in technology for development? What specific role should the Bank Group play?

*(continued)*

9. What approaches or lessons relating to organizational effectiveness from other organizations or the private sector that you are familiar with could be applicable for the Bank Group to enhance its effectiveness? Please explain why.

10. What three recommendations do you have for the Bank Group to enhance its organizational effectiveness in helping clients harness the opportunities and mitigate the risks posed by DTT?

Probe for:

- (i) Skills mix and how new knowledge is acquired for DTT
- (ii) Internal decision-making, collaboration, and budget processes
- (iii) Incentives for risk taking and learning from failure
- (iv) Areas of comparative advantage in DTT
- (v) Experience with eternal partnerships

Source: Independent Evaluation Group.

Note: This semistructured interview questionnaire was used for the corporate priority thematic reviews on country diagnostics, agile regulation, and education. DTT = disruptive and transformative technologies.

**Table A.8.** NVivo Coding Scheme

Level					Keywords
1	2	3	Code	Description	Stems and synonyms were used
1.0000			DTT incentives		
	1.05		Incentives Yes	Instances that identify the presence of incentives for DTT-relevant work, for example accessibility to data science classes	Incentive, incentives, incentivize, incentivized
		1.0505	Incentives_Innovation_yes	Instances that identify the presence of incentives for innovation in DTT-relevant work	Innovate, innovation, inventive, incentive, incentives, incentivize
		1.0510	Incentive_risk taking_yes	Instances that identify the presence of incentives for risk taking in DTT-relevant work	Risk, Incentive, incentives, incentivize
	1.10		Incentives No	Instances that identify the lack of incentives for DTT-relevant work	Incentive, incentives, incentivize, incentivized

(continued)

Level			Code	Description	Keywords
1	2	3			<i>Stems and synonyms were used</i>
		1.1005	Incentives_Innovation_no	Instances that identify the lack of incentives for innovation in DTT-relevant work	Innovate, innovation, inventive Incentive, incentives, incentivize
		1.1010	Incentive_risk taking_no	Instances that identify the lack of incentives for risk taking in DTT-relevant work	Risk, incentive, incentives, incentivize
<b>2.0000</b>			<b>Staffing</b>		
	2.05		Sufficient skills	Instances that identify presence of adequate staffing with respect to DTT-relevant work	Skills, training, staff, experts
	2.10		Insufficient skills	Instances that identify lack of adequate staffing with respect to DTT-relevant work	Skills, training, staff, experts
	2.15		Sufficient mindset	Instances that identify presence of adequate staffing with respect to a DTT-relevant mind-set	Mind-set, think, thought, thinking, leadership, leader, lead
	2.20		Insufficient mindset	Instances that identify lack of adequate staffing with respect to a DTT-relevant mind-set	Mind-set, think, thought, thinking, leadership, lead
<b>3.0000</b>			<b>Collaboration</b>		
	3.05		Sufficient collaboration	Instances that identify the presence of adequate collaboration for DTT-relevant work	Collaboration, collaborate, support

(continued)

Level					Keywords
					<i>Stems and synonyms were used</i>
1	2	3	Code	Description	
		3.0505	Sufficient collaboration due to structures	Instances that identify the presence of adequate collaboration for DTT-relevant work due to internal structures, for example cross-Global Practice collaboration	Collaboration, collaborate, support, Global Practice, sector, cross
		3.0510	Sufficient collaboration due to budget	Instances that identify the presence of adequate collaboration for DTT-relevant work due to budget allocation	Collaboration, collaborate, budget, allocate, allocation, assign, assignment, money, cross
	3.10		Insufficient collaboration	Instances that identify the lack of adequate collaboration for DTT-relevant work	Collaboration, collaborate, support
		3.1005	Insufficient collaboration due to structures	Instances that identify the lack of adequate collaboration for DTT-relevant work due to internal structures, for example cross-Global Practice collaboration	Collaboration, collaborate, support, Global Practice, sector, cross
		3.1010	Insufficient collaboration due to budget	Instances that identify the lack of adequate collaboration for DTT-relevant work due to budget allocation	Collaboration, collaborate, budget, allocate, allocation, assign, assignment, money, cross
<b>4.0000</b>			<b>Processes and Procedures</b>		
	4.05		<b>Procurement</b>		
		4.0505	Sufficient procurement	Instances that identify the presence of procurement systems conducive to DTT-relevant work, for example adequate guidance for complex technology investments	Procurement, specification, capacity, investment

(continued)

Level					Keywords
1	2	3	Code	Description	<i>Stems and synonyms were used</i>
		4.0510	Insufficient procurement	Instances that identify the lack of procurement systems conducive to DTT-relevant work. For example, adequate guidance for complex technology investments	Procurement, specification, capacity, investment
	4.10		<b>Budget</b>		
		4.1005	Adequate budget	Instances that identify the presence of adequate budget for prioritizing DTT support	Budget, allocate, allocation, assign, assignment, money
		4.1010	Inadequate budget	Instances that identify the lack of adequate budget for prioritizing DTT support	Budget, allocate, allocation, assign, assignment, money

Source: Independent Evaluation Group.

Note: All third-level codes were aggregated at second level. DTT = disruptive and transformative technologies.

## Box A.1. Education Corporate Priority Methodology— Section I: Literature Review

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(continued)

## Box A.1. Education Corporate Priority Methodology— Section I: Literature Review

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Source: Independent Evaluation Group.

**Table A.10.** Education Corporate Priority Methodology—Section II:  
Keywords for Identifying Education and DTT-Related Projects

Keywords		
1. achievement striving	74. modesty	147. compute
2. adapt	75. modules	148. CS
3. adult learning	76. motivation	149. cyber
4. adventurous	77. negotiation	150. debug
5. aesthetics	78. neuropsychological	151. design
6. agreeableness	79. neuroticism	152. digi
7. altruism	80. OER	153. disrupt
8. anxiety	81. open educational resources	154. drone
9. assertiveness	82. openness	155. electric
10. attention	83. optimism	156. electronic
11. attitude	84. parenting	157. e-logistics
12. autonomous learning	85. perseverance	158. engineering
13. behavior	86. persistence	159. fablab
14. bootcamps	87. personality	160. Facebook
15. brain development	88. positivism	161. facial recognition
16. build relationships	89. PowerPoint	162. Google
17. building consensus	90. problem-solving	163. hack
18. caregiving	91. psychosocial	164. ICT
19. caring	92. reflect	165. information processing
20. century skills	93. resilience	166. information technology
21. character	94. responsibility	167. internet
22. cognition	95. scientific models	168. invent
23. collaboration	96. search engines	169. IOT
24. communication	97. self-consciousness	170. iPad
25. compassion	98. self-control	171. iPhone
26. conscientiousness	99. self-discipline	172. IT
27. cooperation	100. self-efficacy	173. laptop
28. counseling	101. self-esteem	174. leapfrog
29. creative	102. self-management	175. LinkedIn
30. creativity	103. self-perception	176. machine
31. critical thinking	104. sensitivity	177. mechanized
32. curiosity	105. smart	178. Microsoft
33. delay of gratification	106. sociability	179. mobile
34. distance learning	107. social competence	180. moonshot
35. dutifulness	108. social connections	181. network
36. ed-tech	109. social intelligence	182. new business models
37. efficiency	110. social skills	183. new economy

(continued)

## Keywords

38. e-learning	111. socialization	184. new jobs
39. electronics	112. soft skills	185. new services
40. e-library	113. stimulation	186. new skills
41. emotion	114. straightforwardness	187. online
42. empathy	115. summative scores	188. optimiz
43. enthusiasm	116. surveillance	189. pattern recognition
44. e-resources	117. sympathy	190. phone
45. excitability	118. teamwork	191. platform
46. extraversion	119. time management	192. privacy
47. fixed abilities	120. tolerance	193. programming
48. flexibility	121. trust	194. prototype
49. foundational skills	122. unconventionality	195. reskill
50. future skills	123. vulnerability	196. retraining
51. game	124. 2G	197. robot
52. goal-driven	125. 3D	198. satellite
53. gregariousness	126. 3G	199. screen
54. grit	127. action labs	200. sensors
55. guidance	128. AI	201. simulat
56. happiness	129. algorithm	202. social media
57. higher-order thinking	130. Amazon	203. software
58. humility	131. analog design	204. tablet
59. imagination	132. analytics	205. tech
60. imaginative	133. artificial intelligence	206. telecom
61. impulse	134. automate	207. teleworking
62. initiative	135. automation	208. terabytes
63. integrity	136. big data	209. time series
64. interpersonal	137. blockchain	210. tinkering
65. intrapersonal	138. bots	211. transform
66. irritability	139. broadband	212. web
67. leadership	140. cable	213. WeChat
68. life satisfaction	141. cellular	214. Whatsapp
69. life skills	142. circuits	215. workplace readiness
70. lifelong learning	143. code	216. YouTube
71. logical rules	144. coding	
72. makerspace	145. complex	
73. mindset	146. computation	

Source: Independent Evaluation Group.

Note: AI = artificial intelligence; CS = computer science; DTT = disruptive and transformative technologies; ICT = information and communication technology; IT = information technology; IOT = internet of things, OER = Open Educational Resources.

**Table A.11.** Education Corporate Priority Methodology—Section III: Coding Protocol for Categorizing Projects and ASA for Education

Question of Interest	Code	Definition	World Bank Examples
Identify projects that apply DTT to improve education	Data management using technology	Use this code to identify projects and ASA that use big data or digital platforms to aid data management and data sharing among stakeholders.	Guinea-Bissau: The Quality Education for All Project establishment of online portal and key education information (that is, national policies, laws, statistics, and others), publicly available.
	ICT-based learning enhancement	Use this code to identify projects and ASA that use ICT to aid learning.	Democratic Republic of Congo: The Education Quality Improvement Project delivers early childhood education using Interactive Audio Instruction in the project provinces.
	Teacher training	Use this code to identify projects and ASA that: <ul style="list-style-type: none"> <li>» Employ technologies to enhance teacher training, for example online teacher training</li> <li>» Enhance STEM-related skills of teachers</li> <li>» Impart socioemotional training to teachers to aid students' interpersonal skills or intrapersonal skills</li> </ul>	Dominican Republic: The National Education Pact Project supports the Ministry of Education to leverage ICT for strengthening in-service teacher training through online courses as part of the activities to improve recruitment and training of primary and secondary school teachers.

*(continued)*

Question of Interest	Code	Definition	World Bank Examples
Identify projects that prepare people to develop technology in the new economy	Teaching relevant skills to aid development of new technologies	Use this code to identify projects that teach science, engineering, and mathematics or technology skills to students that aid development of new technologies. <i>Note: Only higher education (master's level and above).</i>	Africa Fund for Science—Africa Regional Scholarship and Innovation Fund for Applied Sciences, Engineering, and Technology. Development objective: To strengthen the institutional capacity for quality and sustainable doctoral training, research, and innovation in transformative technologies in Sub-Saharan Africa. <i>Note: One example might be relevant for more than one code. For instance, this example applies to “teaching technology skills,” but it is also relevant for the category “teaching/ enhancing cognitive competencies.”</i>
Identify projects that prepare people to use or consume technology in the new economy	Provide digital tools to students	Use this code to identify projects and ASA that provide digital tools like tablets, computer, and phones to aid students' digital literacy.	
	Teaching students to use digital tools	Use this code to identify projects and ASA that teach students digital tools like tablets, computer, and phones to aid digital literacy.	

(continued)

Question of Interest	Code	Definition	World Bank Examples
Identify projects that prepare people for new jobs in which humans have a comparative advantage	Teaching/enhancing cognitive competencies: academic mastery, critical thinking, creativity	<p><b>Academic mastery:</b> Learning academic content is fundamental to education, and mastery of such content serves as the basis for higher-order thinking skills and the impetus for improved interpersonal and intrapersonal competencies. Academic content includes instruction in subjects such as mathematics, science, reading, global studies, and foreign languages.</p> <p><i>Note: Only higher education (master's level and above).</i></p> <p><b>Critical thinking:</b> critical thinking includes inductive and deductive reasoning, and making correct analyses, inferences, and evaluations. These competencies are important for deeply understanding academic content, and they also relate to later career performance.</p> <p><b>Creativity:</b> unusualness, appropriateness, and transformation in varying combinations characterize a large proportion of those things we are willing to call creative.</p>	<p>Africa Fund for Science—Africa Regional Scholarship and Innovation Fund for Applied Sciences, Engineering, and Technology. Development objective: To strengthen the institutional capacity for quality and sustainable doctoral training, research, and innovation in transformative technologies in Sub-Saharan Africa.</p> <p><i>Note: "21st-century skills" included for all four codes—Teaching/enhancing cognitive competencies, Teaching/enhancing interpersonal competencies, Teaching/enhancing intrapersonal competencies, and Socioemotional skills.</i></p>

(continued)

Question of Interest	Code	Definition	World Bank Examples
	Teaching/ enhancing interpersonal competencies: communication and collaboration, leadership, global awareness	<p>Communication and collaboration: Communication and collaboration are identified as vital 21st-century competencies. For example, Pellegrino and Hilton (2012) suggest that communication is vital to facilitate teamwork and lies at the core of empathy, trust, conflict resolution, and negotiation.</p>	
		<p>Leadership: More broadly, leadership is not just a competency but a set of competencies. For example, a study conducted across Asian countries suggested that leadership involves having initiative, building consensus, innovating new strategies, and implementing policies and programs in collaboration with or under the direction of others.</p>	
		<p>Global Awareness: Global awareness has grown in importance in the 21st century as economic, social, and cultural connections among countries have increased. Perhaps the best-studied interpersonal competency that underlies global awareness is empathy.</p>	

(continued)

Question of Interest	Code	Definition	World Bank Examples
	Teaching/ enhancing intrapersonal competencies (growth mindset, learning how to learn, intrinsic motivation, and grit)	Growth mindset: Students with a growth mindset see intellectual abilities as malleable and as a function of effort, good strategies, and help from others, whereas those with a fixed mindset treat intelligence as an innate ability, immune to the efforts of the individual to improve it.	
		Learning how to learn: Learning how to learn, or “metacognition,” refers to a student’s ability to determine how to approach a problem or task, monitor their own comprehension, and evaluate progress toward completion.	
		Intrinsic motivation: Motivation refers to the process that prompts people to take action to attain particular goals, and psychologists distinguish between two types of motivation. Intrinsic motivation refers to forces within the individual that activate behavior.	
	Socioemotional skills		Jordan Education Reform Support Program: Schools with a high proportion of Syrian refugees implemented the socioemotional learning program.

Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; DTT = disruptive and transformative technologies; ECE = early childhood education; ICT = Information communication technology; STEM = science, technology, engineering, and mathematics

**Table A.12.** Corporate Priority Review of Digital Connectivity (World Bank): Reviewed Projects

Project ID	Project Name	FY	Exit FY	Country or Region
P106589	Mexico IT Industry Development Project	2009	2016	Mexico
P115647	E-Society and Innovation for Competitiveness	2011	2016	Armenia
P116273	3A West Africa Regional Communications Infrastructure Program	2011	2017	Western Africa
P116542, P122777, P122398	Central African Backbone Program—APL 1, 3, 5	2011	2013	Africa
P121231	Moldova Governance eTransformation Project	2011	2017	Moldova
P121755	Afghanistan ICT Sector Development Project	2011	2018	Afghanistan
P128013	First ICT Sector Development Operation	2013	2013	Marshall Islands
P130184	West Africa Regional Communications Infrastructure Program APL 1C—Benin	2013	2017	Western Africa
P148588	ICT Sector Support in Somalia	2014	2016	Somalia
P152358	Somalia ICT Sector Support—Phase II	2015	ongoing <sup>a</sup>	Somalia
P155235	Caribbean Regional Communications Infrastructure Program —Nicaragua	2017	ongoing <sup>a</sup>	Nicaragua
P160533	Digital Malawi I	2017	ongoing <sup>a</sup>	Malawi
P156894	Afghanistan Digital CASA Project	2018	ongoing <sup>a</sup>	Afghanistan
P160230	Digital CASA—Kyrgyz Republic	2018	ongoing <sup>a</sup>	Kyrgyz Republic
P160418	Côte d'Ivoire E-Agriculture Project	2018	ongoing <sup>a</sup>	Côte d'Ivoire
P162044	Smart Africa Alliance/Korea Partnership	2018	ongoing <sup>a</sup>	Africa
P162123	Implementing Open Data in Serbia	2018	ongoing <sup>a</sup>	Serbia
P164188	Kosovo Digital Economy	2019	ongoing <sup>a</sup>	Kosovo
P164525	Second Multisectoral Structural Reform	2019	ongoing <sup>a</sup>	Senegal
P164824	Enabling Digital Governance Project	2019	ongoing <sup>a</sup>	Serbia
P168587	Financial Inclusion and Digital Economy DPF	2019	ongoing <sup>a</sup>	Morocco
P118670	P4 Pacific Regional Regulatory Resource Center	2014	ongoing <sup>a</sup>	Pacific
P150543	Support to Open Data in Tanzania	2014	ongoing <sup>a</sup>	Tanzania
P151210	Mexico RAS: IFT—Shared Wholesale Network	2015	ongoing <sup>a</sup>	Mexico

Source: Independent Evaluation Group.

Note: APL = adaptable program loan; CASA = Central Asia–South Asia; DPF = development policy financing; FY = fiscal year; ICT = information and communication technology; IFT = Federal Telecommunications Institute of Mexico; IT = information technology; RAS = reimbursable advisory services. a. Ongoing as of August 26, 2020.

**Table A.13.** Corporate Priority Review of Digital Connectivity (IFC):  
Reviewed Projects

Project ID	Project Name	Fiscal Year	Status	Country or Region
35939	Zenium	2015	Closed	Turkey
33645	Logo	2014	Closed	Turkey
32367	Protelindo	2014	Closed	Indonesia
30603	Grameen Phone V	2013	Active	Bangladesh
39752	IGT Equity	2017	Active	Myanmar
34980	Tikona Broadband	2015	Active	India
30402	Altobridge	2011	Active	World Region
29741	IHS Nigeria	2011	Closed	Nigeria
30136	EMC	2012	Closed	Africa Region
32782	IHS Africa	2013	Closed	Africa Region
34454	IHS Rwanda	2014	Closed	Rwanda
35725	IHS Nigeria 2	2015	Closed	Nigeria
27526	Wind Telecom	2011	Active	Dominican Republic
31812	VMLA—Chile	2013	Closed	Chile
36722	Phoenix Tower Brazil	2016	Closed	Brazil
37968	Cabo Telecom II	2018	Active	Brazil
41688	Cabo Telecom III	2019	Active	Brazil
33142	On Telecom	2014	Active	Brazil
31170	IXcellerate	2012	Active	Russian Federation
39715	Zain Iraq II	2018	Active	Iraq
35289	Nxtgen	2015	Active	India
34170	Ooredoo Myanmar	2016	Active	Myanmar
36136	Robi Axiata II	2016	Active	Bangladesh
32630	TeamNet Romania	2014	Active	Romania
35725	IHS Nigeria 2	2015	Closed	Nigeria
35932	BTS Towers	2016	Active	Peru

Source: Independent Evaluation Group.

Note: IFC = International Finance Corporation.

**Table A.14.** Corporate Priority Review for Digital Government Services: Reviewed Projects

Country or Region	Project ID	Project Name
West Africa	P161329	West Africa Unique Identification for Regional Integration and Inclusion (WURI) Program
Bangladesh	P132634	Bangladesh: Safety Net Systems for the Poorest
Morocco	P155198	Identity and Targeting for Social Protection
Tanzania	P124045	Tanzania: Productive Social Safety Net
Ethiopia	P151712	Urban Productive Safety Net
Madagascar	P172202	Madagascar ID User Research and Outreach

Source: Independent Evaluation Group.

**Table A.15.** Review of Fintech and Digital Entrepreneurship: Reviewed Projects

Project ID	Project Name	Fiscal Year	Country or Region
P161317	Kenya Industry and Entrepreneurship	2018	Kenya
P168897	Lao PDR Payment Systems (FIRST Initiative)	2018	Lao PDR
P151544	MSME Growth Innovation and Inclusive Finance Project	2015	India
P133789	CO Sound Financial Sector Development	2018 (completion of ASA)	Colombia
P128048	Afghanistan Access to Finance	2014	Afghanistan
P167435	Disruptive Technologies for Development Program	2018	World
P131091	Supporting the Ecosystem for Fostering a Dynamic Entrepreneurship in MENA	2012	Middle East and North Africa
P128167	How to Finance Innovation Technology and Entrepreneurship	2012	Middle East and North Africa
P157826	Mongolia: Financial Sector Development Support Program	2020	Mongolia
37402	Net1	2016	South Africa
36516	Remitly	2017	World
40491	Konfio Debt	2018	Mexico

(continued)

Project ID	Project Name	Fiscal Year	Country or Region
32942	Earthport	2013	South Asia
37584	Afluenta	2015	Argentina
31958	bKash	2013	Bangladesh
38728	CompareAsia	2017	East Asia and Pacific

Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; MENA = Middle East and North Africa; MSME = micro, small, and medium enterprise.

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ington, DC.

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<sup>1</sup> Tertiary education projects target post-secondary (12th grade) students and includes technical and vocational education and training projects. Roughly three-quarters (73 percent) of tertiary education projects are housed in the Education Global Practice, and these 200 projects are included in the analysis undertaken for this evaluation in addition to 31 projects from Jobs and Social Protection, 9 projects from Macroeconomics, Trade, and Investment, 4 projects from Agriculture, and 32 projects from other Global Practices. The bulk (61 percent) of the World Bank's support for tertiary education has been through analytic and advisory activities, 35 percent of which has been advisory services and analytics.

# Appendix B. The World Bank Group's DTT Mainstreaming Approach

The World Bank Group's new approach to disruptive and transformative technologies (DTT) comprises three Bs—build, boost, and broker—five corporate priorities, and sectoral and regional programs as outlined in the 2018 Development Committee paper (World Bank 2018a), subsequently merged with the 2019 Development Committee paper (and also called the Mainstreaming paper; World Bank 2019c). The new approach also comprises support to fintech and digital entrepreneurship, as outlined in the 2018 Bali Fintech Agenda (World Bank 2018b). Recently, the Bank Group's DTT approach has been further updated through the 2020 Mainstreaming Digital and Disruptive Technologies (MDDT) Program Document described at the end of this appendix.

## Three Bs: Build, Boost, Broker

The Bank Group's Mainstreaming paper indicates that the new Mainstreaming approach aims to support countries to create opportunities and mitigate risks associated with DTTs through the build-boost-broker value proposition:

- » **Build** digital infrastructure and regulatory foundations.
- » **Boost** the capacity of institutions, communities, firms, and individuals by developing digital skills, foundational cognitive and socioemotional skills, and social protection.
- » **Broker** partnerships between public and private sectors and support global coalitions to ensure that disruptive technologies are harnessed for accelerating progress toward the Sustainable Development Goals and the Bank Group's twin goals.

## Five Corporate Priorities

The Bank Group's Mainstreaming paper describes five corporate priorities (World Bank 2019c, iv–v):

- » **Corporate Priority One:** The [Bank Group] is supporting *country diagnostics* to help countries maximize the opportunities and mitigate the risks posed by disruptive technologies. It is developing a new set of diagnostics to benchmark countries' readiness to absorb disruptive technologies by assessing what foundational elements need to be *built*, what capacities need to be *boosted*, and what sectors offer opportunities for disruptive technology to be *brokered*. The [Bank Group] is developing new indicators to measure the digital economy and using disruptive technologies for improved data collection. These tools will inform the [Bank Group's] regular high-level country assessments. In addition, global and regional flagship reports present evidence on how new sources of data, technology, and expertise can support inclusive growth strategies in specific country contexts.
- » **Corporate Priority Two:** The [Bank Group] is supporting the formulation and implementation of *agile regulations* that promote innovation and mobilize the private sector while addressing risks associated with technological disruptions of sectors and markets. To *build* regulatory foundations and *boost* capacity of firms, particularly local entrepreneurs, the [Bank Group] is scaling up technical assistance and analytical work in three areas: disruptions of traditional sectors, new business models and sources of market power, and risks related to privacy and data security. And it is participating in international forums and partnering with other international organizations to ensure that the experiences and concerns of developing countries are well represented in areas such as digital taxation and international data flows.
- » **Corporate Priority Three:** The [Bank Group] is prioritizing support for *universal and affordable digital connectivity*. To *build* digital infrastructure, it is working with public and private partners across the value chain of broadband networks, leveraging the Maximizing Finance for Development and Cascade approaches in addressing policy and institution reforms, implementing large regional projects, and developing new business models that mobilize private investment such as cross-sector infrastructure sharing. By promoting univer-

sal, affordable connectivity it is ensuring that people in fragile, conflict-affected, rural, and remote areas are not left behind. And to prime demand for digital connectivity, it is providing underserved populations with online access to markets and services.

- » **Corporate Priority Four: The [Bank Group] is supporting the provision of transparent, efficient, and accountable *digital government services* through a new GovTech global initiative.** GovTech is a [Bank Group] whole-of-government approach that will develop new tools and interventions to help governments harness DTT to *boost* capacity in core government functions, in public service delivery, particularly for poor people, and in technology-enabled citizen engagement. It will improve the functioning of the public sector and catalyze private sector engagement.
- » **Corporate Priority Five: The [Bank Group] is supporting investment in human capital to develop *skills and capabilities for the new economy*.** The *World Development Report 2019* and the Human Capital Project highlighted how the changing nature of work is accelerating the need to *boost* the capacity of people by investing in human capital, especially in skills and capabilities (World Bank 2019[d], Gatti and others 2018). The [Bank Group] is engaging with public and private clients to promote investments in skill development over the life cycle, from early childhood to adult learning. It is also working to *boost* the managerial capabilities of firms to absorb new technologies and create jobs.

## Sectoral and Regional Programs

The Mainstreaming paper notes that the Bank Group “is developing sectoral and regional programs that leverage the five corporate priorities.” These programs, such as the sectoral programs listed in the next paragraph and the Digital Economy for Africa (DE4A) Moonshot/Accelerate and MNA (Middle East and North Africa) Tech are expected to allow the Bank Group “to be selective, minimize duplication, explore synergies between projects and disruptive technologies, and leverage public and private partnerships to *build, boost, and broker*. Partnerships are essential to identify and scale up potential applications of disruptive technologies to solve development challenges” (World Bank 2019c, 5).

Several Bank Group sectoral strategies and programs recognize the importance of DTT (World Bank 2020):

- » The [Bank Group Sustainable Energy Strategy](#) relies on disruptive technologies such as renewable energy off-grid solutions, which are identified as the most rapid means of providing cost-effective energy services in rural, remote, and isolated areas.
- » The *World Bank Outlook 2050: Strategic Directions Note on Supporting Countries to Meet Long-Term Goals of Decarbonization* prioritizes the vision to use digital technologies to achieve decarbonization and resilience while pursuing carbon neutrality for the digital sector itself.
- » [Accelerating Battery Storage for Development](#) is a global program to accelerate investments in battery storage for electric power systems. The program is intended to increase developing countries' use of wind and solar power, and improve grid reliability, stability, and quality, while reducing carbon emissions. The program includes \$1 billion from the Bank Group and will mobilize an additional \$1 billion of concessional climate finance and \$3 billion from the private sector. The International Finance Corporation is also investing in emerging storage technology for vehicles and assessing opportunities to deploy grid-scale storage technology.
- » The [Bank Group Strategy for Health, Nutrition and Population](#) prioritizes a portfolio shift from traditional systems toward health systems based on the latest technologies in areas such as telemedicine, artificial intelligence, big data, machine learning, diagnostic advances, e-health, and m-health with the aim of making health services accessible and affordable for all patients, including from their own homes.
- » The [Bank Group's Education 2020 Strategy](#) highlights that technological advances are changing job profiles and skills, while offering possibilities for accelerated learning.
- » The [Bank Group 2030 Sustainable Development Agenda](#) notes the importance of innovation and technology in building sustainable economies and expanding the capacity of people and institutions to thrive in the rapidly evolving environment.

- » A forthcoming report, [Digital Acceleration of Agricultural Transformation 2020](#), recognizes the need for accelerating the digital transformation of the agriculture sector, which can disrupt the level and allocation of physical capital (for example, agricultural equipment), labor, and natural capital (such as geology, soil, air, and water) and raise productivity.
- » The [Jobs and Economic Transformation framework for the 19th Replenishment of the International Development Association](#) emphasizes digital transformation as a key priority. During the 19th Replenishment, the Bank Group will support the creation of dynamic digital economies to speed up transformation of both the private and public sectors. Digital development cuts across all facets of the Jobs and Economic Transformation agenda, supporting productivity growth in the agricultural sector and facilitating the structural transformation process by enabling technological leapfrogging, development of new high-productivity sectors, and new forms of market connectivity.
- » The [Bank Group Strategy for Fragility, Conflict, and Violence](#) emphasizes the need for systematizing the use of digital solutions in fragility, conflict, and violence setting, such as Geo-Enabling for Monitoring and Supervision and remote-sensing technologies to enhance supervision and implementation.

## Digital Economy for Africa

The DE4A Moonshot/Accelerate aims to digitally connect every individual, business, and government in Africa by 2030 and ensure each is digitally enabled and ready to thrive in the digital economy (World Bank 2019a). DE4A Moonshot/Accelerate would commit all African countries, development partners, and the private sector to policies, actions, and programs that catalyze digital transformation to achieve the DE4A Moonshot/Accelerate targets and to massively expand efforts and dedicate resources to build the foundations of a thriving digital economy. It will take leadership and vision to push the frontiers of innovation, collaboration, and integration so that Africa can own the twenty-first century. Achieving the DE4A Moonshot/Accelerate objectives will require strong, sustained leadership and a massive expansion of resources dedicated to building the foundations of the digital economy in every African country.

The DE4A Moonshot/Accelerate is underpinned by five principles and depends on five prerequisite foundations for its implementation. For dynamic, inclusive, and safe digital economies to emerge, African countries will need to follow a holistic approach to building strong foundations for allowing use cases to flourish across the different sectors (e-agriculture, e-health, e-government or GovTech applications, and the like). Examination of the experiences of successful digital economies shows that five foundations need to be in place:

- 1. Digital infrastructure.** For the digital economy, good connectivity through the internet or broadband is a critical foundation. Broadly, digital infrastructure consists of connectivity (through, for example, high-speed internet and internet exchange points), the internet of things (connecting mobile devices, computers, sensors, voice-activated devices, geospatial instruments, machine-to-machine communications, vehicle-to-vehicle communications), and data repositories (such as data centers and clouds).
- 2. Digital platforms.** Digital platforms offer products and services, accessible through digital channels such as mobile devices, computers, and the internet, for all aspects of life. One foundational platform for the digital economy is digital ID systems and trust services. Digital ID systems and services, such as electronic signatures, underpin trust in online transactions and create opportunities to innovate how products and services are delivered. Other foundational platforms include government-operated digital platforms that offer people-facing government services (such as online facilities to pay taxes, renew a driver's license, and validate a digital ID), share information (such as with open data or reusable public sector data), and run back-office systems (such as by digitally managing government accounting and human resource information). Global connectivity allows users to use services and access information regardless of geographic location, leading to global services such as Google Search, Facebook, or Amazon Web Services.
- 3. Digital financial services.** Access to affordable and appropriate digital financial services is critical for the participation of individuals and businesses in the digital economy. Firms can leverage digital financial services to transact with their customers and suppliers more easily and to build digital credit histories and seek financing. Governments can use digital finan-

cial services to increase efficiency and accountability in various payment streams, including for the disbursement of social transfers and receipt of tax payments. Digital payments are often the entry point for digital financial services and provide the infrastructure or “rails” through which additional products and use cases can be developed, as has been demonstrated by the evolution of M-PESA in Kenya, and Alipay/Tenpay in China. A digital financial services ecosystem requires forward-looking and proportionate legal and regulatory frameworks (for example, to allow market entry and innovation), robust financial infrastructures (for example, national payment systems and credit reporting systems), and development and deployment of low-cost delivery channels (for example, agents, point of sale devices, automated teller machines, and mobile phones).

4. **Digital entrepreneurship.** Digital entrepreneurship and innovation create an ecosystem to bring the digital economy to life—with new, growth-oriented ventures, and transformation of existing businesses—contributing to net employment growth and helping enhance competitiveness and productivity of an economy. Digital entrepreneurship offers new products and services, leverages new technologies and business models, and opens new markets. Vibrant digital entrepreneurship ecosystems encompass skill development (through, for example, business mentoring networks), ecosystem support infrastructure (such as accelerators, incubators, innovation hubs, and coworking spaces), and access to markets and early-stage financing (such as seed financing and venture capital); they require a conducive and enabling business environment that motivates the creation and use of novel digital technologies.
5. **Digital skills.** Economies require a digitally savvy workforce to build robust digital economies and competitive markets. Digital skills constitute technology skills, together with business skills for building or running a start-up or enterprise. Greater digital literacy further enhances adoption and use of digital products and services among the larger population. Advanced digital skills to create local content and drive made-in-Africa solutions are needed to ensure an inclusive digital economy where Africa not only is on the consumer side of the digital revolution but also plays an important role in producing technology.

## MNA Tech Initiative

According to the Bank Group’s MNA Tech Concept Note, this initiative is advisory services and analytics (World Bank 2019b). It was launched in 2019 and will run until 2023. It is led by the Finance, Competitiveness, and Innovation Global Practice, with support from the following Global Practices: Digital Development, Education, Governance, and Macroeconomics, Trade, and Investment. The objective of the MNA Tech Initiative is to support Bank Group teams and engage stakeholders in the Region to achieve the Middle East and North Africa Vice Presidency goals on the digital economy. During the 2019 regional update to the Board of Executive Directors, the Middle East and North Africa Vice Presidency adopted a set of digital transformation priority targets to be achieved by the annual meeting in Marrakesh in 2021; these pertain to digital infrastructure and digital finance: doubling broadband connectivity from 32 percent to 60 percent and significantly increasing cashless payments in the Region, from its current level of 34 cashless transactions per capita per year to 116 by 2021 (also called the Marrakesh 2021 goals). The Middle East and North Africa Strategy includes a commitment to promote inclusive growth and quality jobs by improving contestability in markets through disruptive technologies and digital payments.

## Bali Fintech Agenda

Fintech holds promise for reducing costs and frictions, increasing efficiency and competition, narrowing information asymmetry, and broadening access to financial services, especially in low-income countries and for underserved populations (IMF 2018). At the same time, national authorities are concerned about potential risks. These include consumer and investor protection, the consistency of regulatory and legal frameworks, the adequacy of existing financial safety nets, and potential threats to financial integrity. To address market trends and future opportunities and concerns, the International Monetary Fund and the World Bank approved the Bali Fintech Agenda in 2019 (box B.1). An update on the experience with the agenda (IMF 2019) measured the global impact of fintech on the provision of financial services. Technologies ranging from artificial intelligence to mobile applications are providing new solutions that seek to increase the efficiency, accessibility,

and security of financial services provision. For example, slow, costly, and hard-to-track traditional payment and remittances services are being supplemented with new solutions, built on cloud computing, digital platforms, and distributed ledger technologies. Borrowing services are affected by new algorithms, such as smart contracts or artificial intelligence or machine learning applied to large volumes of data. This improves credit risk modeling and allows lending to new borrowers. Likewise, advances in artificial intelligence, digital ID, and cybersecurity are enabling new models for managing risk for individuals, financial institutions, and regulators (IMF 2019).

### Box B.1. Principles of the Bali Fintech Agenda

The Bali Fintech Agenda outlines 12 high-level considerations:

- » Embrace the promise of fintech.
- » Enable new technologies to enhance financial service provision.
- » Reinforce competition and commitment to open, free, and contestable markets.
- » Foster fintech to promote financial inclusion and develop financial markets.
- » Monitor developments closely to deepen understanding of evolving financial systems.
- » Adapt regulatory framework and supervisory practices for orderly development and stability of the financial system.
- » Safeguard the integrity of financial systems.
- » Modernize legal frameworks to provide an enabling legal landscape.
- » Ensure the stability of domestic monetary and financial systems.
- » Develop robust financial and data infrastructure to sustain fintech benefits.
- » Encourage international cooperation and information sharing.
- » Enhance collective surveillance of the international monetary and financial system.

Furthermore, the International Finance Corporation has identified four key determinants for the speed of adoption of fintech that to a large degree reflect the 12 elements of the Bali Fintech Agenda. First is universal, affordable, and secure mobile connectivity (Andrews and Schmitz 2019). Second, operators must agree to technical standards that support interoperability. Third, regulators need to adopt new frameworks. Fourth, users must be able to identify themselves online reliably and securely.

Source: IMF 2018

# Mainstreaming Digital and Disruptive Technologies

The development objective of the 2020 Program Document for the MDDT Initiative is to support units and teams in the scaling-up of appropriate high-quality digital and disruptive technology solutions in World Bank projects. An immediate focus of the initiative will be supporting the COVID-19 emergency response and recovery and knowledge sharing and supporting the development of knowledge products. This will be achieved through establishing a Network and a Technical Working Group aimed at connecting teams and programs across the Bank Group, and by establishing a Secretariat aimed at supporting the Network, the Technical Working Group and the implementation of an initial set of activities. The focus will be on technology “applications,” and the initiative will not include the foundations of the digital economy that are covered by other programs (such as DE4A).

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# Appendix C. Gender and Disruptive and Transformative Technology

Technology offers the potential to improve gender equality in multiple domains. More flexible work arrangements made possible by technology may reduce the gender gaps in labor force participation. Use of the same technical skills may reduce gender wage gaps. Increased access to information made possible by technology can affect gender norms and aspirations faster than expected, for example through social media.<sup>1</sup> Digital economy innovations such as digital payments, mobile money, and taxi-sharing rides can all increase agency and control over economic resources and safety. Compared with manual cash transfers, greater privacy and control of mobile transfers by female recipients in Niger shifted intrahousehold decision-making in their favor (World Bank 2016, 134). Digitized social protection systems help bring low-income women into the financial sector by enabling conversion of social benefits from cash to electronic accounts (World Bank 2015, 52). Biometric identity assists women with limited proof of identity to open savings accounts (World Bank 2015, 52). Mobile phones can be an effective way to improve health system performance in areas of low internet coverage. Health extension workers remind registered women of key appointments through automated short message service (World Bank 2016, 190).

At the same time, technology may pose a risk for women. In poor and remote areas, the internet is more likely to be accessed outside the home, where social norms for socializing or safety concerns are a barrier for women. Increased access to credit, knowledge, or markets made possible by disruptive and transformative technologies (DTT) can also place women at higher risk for domestic violence (McDougal and others 2019). Women and girls are more likely than men and boys to experience threats of intimidation, harassment, defamation, violence, surveillance, or some combination of these (World Wide Web Foundation 2015).

Gender-differential effects of DTT are manifest in the use of and access to technology. More men than women have access to mobile phones and the internet, especially in many parts of Africa and South Asia. Over 1.7 billion women in low- and middle-income countries do not own mobile phones. Women in these countries are 14 percent less likely to own a mobile phone than men on average, and 38 percent of women in South Asia are less likely to own a phone (World Bank 2016, 134). In Africa, women are 50 percent less likely than men to use the internet (World Bank 2016, 134). More men than women also have a bank account, and the gender gap in account ownership has remained consistent since 2011 (World Bank 2015, 52). The main barrier for women, according to the World Bank Group Gender Strategy (2015) is that relative to men, females have less access to the financial and educational capabilities required to adopt technology. Owing to childcare and domestic duties, women have less time than men to improve their technology skills. Indeed, it is often the off-line factors associated with poverty, gender discrimination, and gender stereotypes that prevent women from benefiting from technology to the same extent as men. Automation in the workplace poses a greater risk for women with less formal education, who tend to be overrepresented in routinized work (Brussevich and others 2018). Men were almost eight times as likely as women to work in information and communication technology (ICT) jobs in 30 emerging markets (World Bank 2019b, 18).

Bank Group strategic documents recognize the gender-differential effects of DTT. Both the Bank Group Gender Strategy and the Mainstreaming paper note that harnessing technology for gender equality will require overcoming lower mobile phone ownership by women (World Bank 2015; World Bank 2019b). The “improving human endowments” objective of the Gender Strategy states that technology is one of many factors that can help increase girls’ enrollment in science, technology, engineering, and mathematics and advocates female take-up of technical and vocational education and training to address the sociocultural barriers at secondary level and increase participation in these subject areas (World Bank 2015, 37). Networking and increased access to technology, markets, and finance may alleviate the constraints experienced by women-owned enterprises, which tend to be smaller, more informal, and less high-tech (World Bank 2015, 52). Use of technology to promote universal identification can help remove barriers to women’s ownership

of and control over assets and prioritize financial inclusion to close gender gaps.<sup>2</sup> Harnessing technology will require overcoming entrenched social mores and gender sorting patterns across occupations and sectors differentially affected by disruptive technologies (World Bank 2019b, 15). For example, occupational sex segregation keeps women in public sector occupations (World Bank 2015, 46), and female labor force participation in the ICT sector is low (World Bank 2016, 134). Table C.1 highlights initiatives being pursued by the World Bank to address the gender-differential effects of DTT.

Output from the portfolio review for this evaluation suggested that further efforts are needed. Of the 51 projects with ICT sector percentage weight at or above 50 percent, 37 percent had all of the gender-relevant flags, and 76 percent had one or more gender flags (they identified specific actions to address gender gaps, included analysis to identify project relevant gaps between males and females, and had indicators to monitor project relevant gender actions).<sup>3</sup> Of the 90 ICT advisory services and analytics (ASA) approved during fiscal years (FY)15–18, just 7 percent were gender relevant. This low presence of gender in ICT-related ASA is a particular concern given that it is in ASA that new opportunities to address the digital gender divide can be explored.

**Table C.1.** World Bank Group Initiatives Addressing Gender Differentials in Technology

Gender Differentials	Initiative(s)	Source(s)
Access, adoption, and use of ICT tools	World Bank Group ICT Toolkit identifies opportunities for using ICT to empower women and suggests a set of actions, drawing from existing examples with the potential to address barriers.	World Bank 2018a
Digital economy	The Moonshot Africa 2030 program's five foundations (digital infrastructure, digital platforms, digital financial services, digital entrepreneurship, and digital skills) will address gender gaps.	World Bank 2019a
Female participation in STEM	Regional initiatives such as African Centers of Excellence and Partnership for Applied Sciences, Engineering, and Technology are improving higher education opportunities in Africa, including for girls.	World Bank 2019b
Social protection	In Zambia, 75,000 girls and women in remote areas receive their cash transfers through a mobile wallet account or a prepaid card.	World Bank 2019b
Financial inclusion	A specific prior action in the DPF for Morocco makes it mandatory for banks and mobile payment companies to report gender-disaggregated data.	Financial Inclusion and Digital Economy DPF
Entrepreneurship	Data from this report are being tested in the Kenya Industry and Entrepreneurship Project. IFC's Digital2Equal cross-sectoral initiative brings together leading online technology companies to boost opportunities for women in emerging markets. IFC's investment in Andela helps companies and start-ups in Sub-Saharan Africa meet their demand for 21st-century skills and retain women in coding bootcamps and talent pipelines. <sup>a</sup>	World Bank 2018b, 2019b

Source: Independent Evaluation Group.

Note: DPF = development policy financing; ICT = information and communication technology; IFC = International Finance Corporation; STEM = science, technology, engineering, and mathematics.

a. Andela is an organization that cultivates information technology talent in Africa and provides leading global technology companies with access to a high-skilled resource pool. IFC is currently supporting Andela as an equity investor. See IFC (n.d.).

## Gender and DTT-Related Projects and ASA

The gender and DTT-related projects and ASA were identified in the following manner.

The first stage included identifying DTT-related projects using sector codes. The team identified 49 World Bank projects by scanning the Business Intelligence database for projects approved during FY15–19 with ICT sector percentage weight at or above 50 percent. The Digital Development Global Practice suggested two more technology projects be included, resulting in 51 DTT-related projects. Regarding ASA, the team identified 90 DTT-related World Bank ASA approved during FY15–18 with ICT sector percentage weight at or above 50 percent.

The team then used gender flags from the World Bank’s Business Intelligence database to identify gender and DTT-related projects. There are three kinds of gender flags: (i) a gender action flag signifies whether the project identifies specific actions to address gender gaps; (ii) a gender analysis flag signifies whether the project includes any analysis to identify gaps between males and females; and (iii) a gender mechanism flag signifies whether the project includes indicators in the results framework to monitor gender outcomes. The team reviewed the 51 DTT-related projects identified in stage 1 and found that 39 of them had one or more gender-relevant flags.

The World Bank does not assign gender flags to ASA. Therefore, the evaluation team used a keyword search to identify gender ASA from the 90 DTT-related ASA identified in the first stage. First, the evaluation team identified 38 keywords using World Bank documents. The team also consulted with gender experts in the Gender Global Practice to ensure that the keywords captured the language and terminology used by World Bank gender experts for DTT-related topics. Second, the team searched the 38 keywords among objectives and abstracts of 90 ASA approved over FY15–18 using R analytics. The keyword search yielded 59 ASA with at least one keyword (table C.2).

The evaluation team then conducted a desk review of the 59 ASA to eliminate false positives. ASA objectives and abstracts and selected ASA documents were scanned, yielding 6 ASA.

**Table C.2.** Project Types

Product Type	Approval Fiscal Year	Technology Projects/ ASA (ICT sector percentage weight at or above 50%)	Projects/ ASA after Gender Flag or Keyword Search	Projects/ ASA after Desk Review
Lending	2015–19	51	39	n.a.
ASA	2015–18	90	59	6

Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; ICT = information and communication technology; n.a. = not applicable.

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<sup>1</sup> “‘My Dress, My Choice’ in Kenya, a social media movement against female violence that mobilized thousands of Kenyans, including through street protests, eventually led to changes in relevant laws” (World Bank 2016, 134).

<sup>2</sup> The gender gap in account ownership has remained consistent since 2011, with more men than women owning a bank account, a disparity that the World Bank’s commitment to universal financial inclusion by 2020 seeks to address (World Bank 2015, 52).

<sup>3</sup> “Gender flag” data were used rather than “gender tag” data, because the latter begins in fiscal year 2016 and was not available for the entire period of this analysis (fiscal years 2015–19).

# Appendix D. World Bank Data Initiatives

## Geo-Enabling for Monitoring and Supervision

The Geo-Enabling for Monitoring and Supervision (GEMS) initiative builds capacity in using simple open-source technology to create customized digital monitoring and evaluation systems. It also provides platforms for remote supervision, real-time risk and safeguards monitoring, and portfolio mapping for coordination across projects and partners. Particularly noteworthy is GEMS's focus on local ownership and capacity building, made possible by its use of tools and methods that are simple, field appropriate, open source, low cost, and directly applicable. The remote supervision capability of GEMS makes it particularly attractive in situations of fragility, conflict, and violence and during the coronavirus (COVID-19) pandemic, which has imposed social distancing requirements and travel restrictions.

GEMS has benefited from a grant from the Korean Trust Fund for Economic and Peacebuilding Transitions based on its support to innovation in fragility, conflict, and violence contexts. The skills of the 15 GEMS team members involve a mix of operational knowledge, experience in working in fragility, conflict, and violence and low-capacity settings, and understanding of technology. As of March 2020, GEMS has been implemented in over 450 World Bank Group-funded projects in 35 countries, and more than 2,000 project implementation units and government employees have participated in capacity-building training.

Constraints have included a Bank Group culture that encourages outsourcing tasks that relate to remote supervision to external companies that offer high-tech platforms. Often, those high-tech approaches are not only very costly and unsustainable but also not always appropriate for low-capacity environments and do not adequately feed into decision-making processes.

Therefore, the GEMS team has opted to only use open-source tools and an innovative application of low-tech solutions that can be sustainably operated in weak-capacity conditions.

Another challenge is that Bank Group staff do not have sufficient time to engage in the various uses of a technology, which results in missed opportunities (for example, that GEMS not only produces eye-catching maps but enables real-time monitoring of almost any kind of operational engagement). Not having enough time may be a symptom of an incentive regime that does not adequately prioritize engaging with innovative in-house solutions and deploying them to their full potential in projects.

GEMS has partnered with several external organizations: Harvard Humanitarian Initiative, provider of the primary open-source technology used by GEMS; United Nations High Commissioner for Refugees; the European Space Agency for remote-sensing support; and bilateral donors, who often benefit from GEMS capacity-building training.

Within the World Bank, GEMS partners include the Joint Data Center for Forced Displacement; the Geospatial Operations Support Team; the Disruptive Technology for Social Development initiative; the Middle East and North Africa remote supervision working group; gender-based violence service provider mapping; the Poverty Global Practice, which oversees the Iterative Beneficiary Monitoring approach; the Smart Supervision App team; and the Geolab in the Information and Technology Solutions Department (ITS).

## Geospatial Operations Support Team

The main aim of the Geospatial Operations Support Team is to help the World Bank make better use of geospatial data. This team offers World Bank task teams a variety of services, including advice on how geospatial data can help solve specific problems, support for purchasing data and imagery, and direct technical assistance. The Analytics and Geospatial Working Group, set up by the Development Data Council, is both the governing body and coordinating body for geospatial operations at the World Bank. It consists of representatives of every Global Practice.

## Development Data Partnership (Formerly Data Collaboratives)

The Development Data Partnership is a partnership between international organizations and companies, created to facilitate the use of third-party data in research and international development. The partnership currently supports more than 60 World Bank operations.

The Development Data Partnership has benefited from the World Bank's support of innovation and open-ended objectives and use of development assignments to empower staff to create new initiatives.

Constraints have included:

- » Difficulty in setting up a streamlined, formal system for receiving annual membership dues from partnership members, which are necessary to ensure the long-term sustainability of the initiative;
- » General lack of coordination in data management and analytics among ITS, the Development Economics Vice Presidency, the Global Practices, and the Regions;
- » High barriers to use of ITS compute resources (confusing procedures, long turnarounds, unavailability of industry-standard data science tools, among other factors);
- » The ITS charge-back system for data compute and storage resources, which is difficult to interpret and not streamlined; and
- » General lack of guiding vision from senior management and lack of a strong data science and data engineering community to make use of the invaluable data resources brought to the World Bank through the partnership.

The continued ability to raise trust funds and funding from external partners will be critical to continuation of the partnership. A long-term institutional home also must be found.

Key technical lessons from the experience so far include the following:

- » Developing template data license agreements and memorandums of understanding among organizations can save time and resources.

- » Developing data governance principles can guide best practices for responsible and ethical data use.
- » Working groups consisting of data engineers, data scientists, sector domain experts, legal counsel, communications specialists, and procurement specialists across organizations have made the platform possible.
- » Centralized information technology architecture and processes for ingesting, storing, and accessing data, and for coding and collaboration, create economies of scale among partners and facilitate secure data use.
- » A web-based partnership management platform helps meet the value proposition for data partners.
- » Managed, accessible repositories for derived data products and algorithms broaden the impact of the partnership.

The Development Data Partnership, supported in part by the Bill and Melinda Gates Foundation, the International Monetary Fund, and Inter-American Development Bank, includes major data partners such as Facebook, Google, Mapbox, Uber, Waze, and Cuebii. Within the Bank Group, collaborating departments include ITS, the Development Economics Vice Presidency, and the Global Practices.

# Appendix E. Foresight and Anticipation

**Foresight and anticipation** mean thinking systematically about tomorrow to inform decision-making today; they can help in planning for development challenges such as climate change or income inequality in the face of the technological revolution. Tools for conducting foresight and anticipation include foresight analysis, horizon scanning, scenario planning, and drivers and trends impact analysis (Conway 2015, 2; Pauwels 2019; van de Pol 2017).

Eleonore Pauwels has pointed out how the convergence of artificial intelligence (AI) with other technologies such as those in the biological world (such as genomics or biotechnology), physical world (such as robotics or 3D printing), and digital world (such as cybersecurity, the internet of things, or quantum computing) raises huge potential for human well-being alongside the risk of large-scale challenges for health, security, economics, and governance in different geopolitical contexts. Pauwels points out that foresight analysis can help anticipate and prevent emerging risks, and emphasizes the need to act collectively because of the spread of AI convergence with other technologies across a wide range of state, nonstate, and transnational actors and entities.

**Role of the United Nations and World Bank Group.** According to Pauwels, the multilateral system of the United Nations can enable collective action, but to do so, the system will need to strengthen its anticipation and prevention capacity relating to emerging and potential risks from technological convergence. AI-driven technologies are spreading beyond the state into the hands of corporations, groups, and individuals. Some major corporations may see little value in bringing multilateral approaches to bear on lucrative, proprietary technologies, while powerful United Nations member states appear more focused on crystallizing their own comparative strengths than in working together to build responsible governance systems in the cyber and biotech spheres. Especially in relation to peace and security, member states may resist attempts to involve the multilateral system in what they see as a fierce competition over powerful new systems of influence.

At the same time, there is a clear understanding that the kinds of risks created by AI convergence do not occur neatly within state boundaries. They manifest globally and must be dealt with across and among states. Against this background, the multilateral system urgently needs to help build a new social contract to ensure that converging technologies, in particular AI, are deployed safely and aligned with the ethical needs of a globalizing world. This new social contract must create opportunities and incentives for governments, citizens, experts, and, in particular, the private sector to commit to a serious, inclusive, and responsible technological future.

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# Appendix F. Creating a Culture of Risk Taking and Innovation

Economist Gary Pisano (2019) writes that a culture of risk taking and innovation can be created by counterbalancing the following seemingly contradictory behaviors:

A tolerance for failure must be counterbalanced by an intolerance for incompetence. Given that innovation involves the exploration of uncertain and unknown terrain, it is not surprising that a tolerance for failure is an important characteristic of innovative cultures. Successful innovative organizations that tolerate failure must also set exceptionally high performance standards for their people. The goal should be to create a culture that simultaneously values learning through failure and outstanding performance. Building a culture of competence requires senior leaders and managers to communicate expected standards for performance clearly and regularly.

A willingness to experiment must be counterbalanced by rigorous discipline. Organizations that embrace experimentation must also be comfortable with uncertainty and ambiguity. They experiment to learn rather than to produce an immediately marketable service. A willingness to experiment, though, requires discipline. Discipline-oriented cultures select experiments carefully based on their potential learning value, and they design them rigorously to yield as much information as possible relative to the costs. They establish clear criteria at the outset for deciding whether to move forward with, modify, or kill an idea.

Psychological safety must be counterbalanced by comfort with brutal candor. Psychological safety is an organizational climate in which individuals feel they can speak truthfully and openly about problems without fear of reprisal. But psychological safety also means that individuals need to be open to receiving criticism when others speak their mind. Unvarnished candor is critical to innovation because it is how ideas evolve and improve. Senior leaders need to set the tone through their own behavior by inviting critique of their own ideas and proposals.

Individual accountability must counterbalance collaboration. Well-functioning innovation systems need information, input, and significant integration of effort from a diverse array of contributors. People who work in a collaborative culture have a sense of collective responsibility. But collaboration does not mean consensus. Consensus can be poison for rapid decision-making and innovation. Someone must decide and be accountable for it. An accountability culture is one where individuals are expected to make decisions and own the consequences.

Strong leadership must counterbalance organizational flatness. In culturally flat organizations, people are given wide latitude to take actions, make decisions, and voice their opinions. They tend to generate a richer diversity of ideas than hierarchical ones, because they tap the knowledge, expertise, and perspectives of a broader community of contributors. Lack of hierarchy, though, does not mean lack of leadership. Paradoxically, flat organizations require stronger leadership than hierarchical ones, and flatness allows leaders to be closer to the action.

## Reference

Pisano, G. 2019. "The Hard Truth about Innovative Cultures." *Harvard Business Review* (January–February): 62–71.

# Appendix G. External Partnerships

## Famine Action Mechanism

Famine Action Mechanism is a large partnership program involving about 40 partners from United Nations agencies, bilateral donors, nongovernmental organizations, civil society organizations, private sector firms (Amazon, Google, and Microsoft), academic institutions, and agencies engaged in food security analysis. The kinds of contributions partners make include data and analytics to inform modeling of famine risks, financing for crisis funding, and operations support to develop Anticipatory Action Plans in pilot countries (Afghanistan, Chad, Somalia, and South Sudan).

Famine Action Mechanism seeks to make financing more predictable and strategic by linking, for the first time, famine early warnings with prearranged financing to ensure that funds are released before a crisis emerges. It also seeks to tackle the root causes of famine and help build livelihoods, safety nets, and stronger coping skills in local communities.

The World Bank Group has brought significant technical expertise to the partnership. The experience so far suggests the following areas for improvement. First, since humanitarian partners work under different mandates and timelines than the Bank Group, greater investment of time and energy by the Bank Group in consulting and coordinating with them would ensure that the Bank Group benefits more fully from their expertise. Such consultation and coordination would also give partners a chance to provide feedback to the Bank Group and make links to their own work, building ownership among them. Second, a clearly defined operational link with Bank Group operations would help ensure that the partnership results in action in the field. This may require Bank Group leadership to signal the importance it attaches to the partnership in enhancing the Bank Group's presence and effectiveness in the field. Finally, Bank Group staff capacity has been a constraint, with technical teams often being overstretched. Once again, signaling by Bank

Group leadership on the importance it attaches to the partnership in helping achieve common goals would be helpful.

## Bank Group–LinkedIn Partnership

The Bank Group–LinkedIn partnership was designed to make aggregated LinkedIn profile data available to the development community for benchmarking and evaluating the human capital assets and emerging (digital) industries and technologies used in the labor force in more than 100 countries, especially in the context of adopting (disruptive) technology for economic growth. These aggregate data can be combined with other third-party or official data for analytical exercise to maximize policy insights that are related to job and technology trends and upskilling needs. The joint website ([linkedindata.worldbank.org](http://linkedindata.worldbank.org)) with visuals of the latest industry and skills trends was launched internally at the Bank Group in November 2018 and made publicly available in April 2019.

A peer-reviewed “World Bank Group–LinkedIn Data Insights” methodology paper highlighting the strengths, limitations, and potential of the LinkedIn data was released to the public (Zhu, Fritzler, and Orłowski 2018). All underlying data sets were accessible by the public via the World Bank’s Development Data Hub as a public good. A more detailed aggregated data set that covers additional metrics, such as LinkedIn occupation data, was also made available to World Bank projects on request. In April 2020 these more detailed internal official-use-only data were also being uploaded to the Development Data Hub but required login from Bank Group computers.

So far, the Organisation for Economic Co-operation and Development, the United Nations Development Programme, the United Nations Environment Programme, and individual researchers in academia seem more ready to adopt the data generated through LinkedIn than Bank Group staff. The Organisation for Economic Co-operation and Development, for example, is using the skills penetration rate for artificial intelligence and talent migration data in its Artificial Intelligence Observatory, and the United Nations Environment Programme is using the data to measure “green skills migration” in its Higher Education Sustainability Initiative. Website visit numbers and data set download numbers were also higher than the ex ante estimates

of similar efforts by LinkedIn. Within the Bank Group, the initial fear was that researchers could misuse the data without fully understanding the caveats, but evidence from more than 10 World Bank projects that piloted use of the data seems to show this risk is manageable, as good researchers tend to use different sources of data to triangulate information and can identify which LinkedIn indicators are most representative and telling for the questions at hand.

LinkedIn's interest in the partnership comes from the Bank Group's ability to encourage governments to use data from alternatives to traditional data sources, such as household surveys. The major challenges for the Bank Group in this partnership include reliability of data sources not of its own provenance and staff reluctance to take risks with new types of data, especially since LinkedIn data tend to be biased toward places and people who are digitally literate and have internet access. The reluctance may also partly arise from the Bank Group's lack of experience or training with big data and other digital data. Overall, the lack of awareness and profile to the partnership internally within the Bank Group may also have been an issue. It would be important to understand the motivations of each party in entering a partnership and to determine if the partnership can deliver what each party wants and the data refresh sustainability plan. So far, LinkedIn is committed to renewing the memorandum of understanding to keep refreshing the data as the indicators mature, and the need for such indicators is still strong. Hosting of the partnership is transitioning to the Development Economics Vice Presidency Data Group to achieve economies of scale.

## Reference

Zhu, Tingting Juni, Alan Fritzler, and Jan Orłowski. 2018. "World Bank Group—LinkedIn Data Insights: Jobs, Skills and Migration Trends Methodology and Validation Results." Working Paper 132009, World Bank, Washington, DC.

# Appendix H. Evolution of the World Bank Group's Approach to DTT

Although the technology engagements of the World Bank Group have been broad—encompassing support to science and technology, research and development, and innovation—specific strategies covering technology have existed mainly for the telecommunications and information and communication technology (ICT) sectors. And the strategies have evolved over time. The pre-2002 approach emphasized expanding communications infrastructure and services and the role of the private sector in unleashing investments in infrastructure, while the public sector would put in place appropriate regulation to promote competition and ensure access. The 2002 ICT strategy reinforced these aspects with a broader mandate for the public sector to support institutional and sectoral reforms. Also, for the first time, it identified support for ICT applications and use in other sectors, and for ICT skills. The 2012 strategy retained focus on earlier priorities but emphasized the use of technology to transform the functioning of governments and service delivery. It also shifted focus from mobile telephony to broadband access and introduced a new pillar to promote innovation and technology entrepreneurship in the private sector, which also subsumed enhancing ICT skills.

In 2018, the Bank Group adopted a new approach to disruptive and transformative technologies (DTT), later merging it with its 2019 DTT Mainstreaming approach. The transition to “mainstreaming” from earlier discrete areas of support marked a significant increase in the Bank Group’s ambition regarding DTT. Accordingly, the Bank Group’s definition of DTT broadened beyond digital technologies to include other technologies (such as robotics, artificial intelligence, the internet of things, biotechnology, 3D printing, solar power, and batteries) and the analog complements (such as policies, institutions, and skills). It also extended beyond the “application” of technology to development challenges (for example, using computers in the classroom) and the “response” to technology (for example, imparting socio-

emotional skills to equip people for future jobs that machines will not be able to perform).

More recently, the development objective of the 2020 Program Document for the Mainstreaming Digital and Disruptive Technologies Initiative is to support units and teams in the scaling-up of appropriate high-quality digital and disruptive technology solutions in World Bank projects. An immediate focus of the initiative will be supporting the COVID-19 emergency response and recovery, and on knowledge sharing and supporting the development of knowledge products. This will be achieved through (i) establishing a Network and a Technical Working Group aimed at connecting teams and programs across the Bank Group, (ii) establishing a Secretariat aimed at supporting the Network and the Technical Working Group, and (iii) implementing an initial set of activities. The focus will be on technology applications, and the initiative will not include the foundations of the digital economy covered by other programs (such as Digital Economy for Africa).

# Appendix I. ID4D: Three Pillars of the World Bank Group's ID4D Support

Based on information from the World Bank's Identification for Development (ID4D) group, World Bank support for ID4D has been spread across the three pillars listed below. The initiatives are fairly new, and no evaluation exists yet of the impact of World Bank-supported ID4D projects on the twin goals or of the extent to which the risks and challenges of ID4D (for example, exclusion, privacy and security violations, vendor or technology lock-in, cybersurveillance, and unsuitable or unsustainable technology and design choices<sup>1</sup>) have been avoided.

1. Thought leadership
  - a. Data on ID system coverage and characteristics:
    - i. The ID4D Dataset, published every two to three years, compiles information on global ID coverage for more than 190 economies.
    - ii. The ID4D-Findex 2017 Survey (which added additional questions to the Findex 2017 Survey) provided the first sample survey across 90+ countries on ID coverage, usage, and barriers to access.
  - b. Practitioner's Guide:
    - i. The Practitioner's Guide is a comprehensive guide on how to implement inclusive and trusted ID systems.
    - ii. The Procurement Guide and Checklist for Digital Identification Systems was developed by the ID4D group in collaboration with World Bank procurement specialists.
2. Global platforms and convening
  - a. Principles on ID for Sustainable Development:

- i. The ID4D group convened and facilitated the development of the ten principles for what makes a good ID system, which are endorsed formally by 25 organizations. These principles have been reflected in country policy documents, including Ethiopia’s Digital Strategy and Somalia’s ID policy.
      - ii. The principles cover data protection and privacy.
    - b. The World Bank has helped shape open-source and open standards platforms to address vendor lock-in and scalability challenges. The first open-source ID platform is being implemented in Morocco and the Philippines and piloted in Guinea.
  - 3. Country and regional action
    - a. Nigeria: ID4D’s technical assistance contributed to (and International Development Association financing is now supporting implementation of) the government:
      - i. Integrating a privacy-by-design approach into the foundational ID system; and
      - ii. Adopting an ecosystem approach to increasing its registration, engaging other government agencies and the private sector to widen availability of registration centers.
    - b. Philippines: ID4D’s technical assistance contributed to the government:
      - i. Adopting an inclusive registration approach for the new foundational ID system;
      - ii. Using a COVID-safe registration approach, which allowed the launch of the registration in October 2020;
      - iii. Adopting of tokenization of the unique ID number so that it is not printed on the physical card and therefore protected from misuse; and
      - iv. Adopting open-source software to promote country ownership of the technology.

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<sup>1</sup> <https://id4d.worldbank.org/guide/creating-good-id-system-presents-risks-and-challenges-there-are-common-success-factors>.

# Appendix J. Select Examples of the World Bank Group's COVID-19 Activities Across Sectors

**Figure J.1.** Select Examples of how COVID-19 Responses are Accelerating WBG Engagement on Digital Foundations and Applications



Source: World Bank 2020, 6

## Reference

World Bank. 2020. “The Final Program Document for Mainstreaming Digital and Disruptive Technologies (‘MDDT’) Initiative.” World Bank, Washington, DC.

# Appendix K. Scaling Access to Solar Energy: Lighting Global and Scaling Solar

Two nondigital disruptive and transformative programs supported by the World Bank Group have aimed to expand access to solar energy.

The Lighting Africa Program is a regional Bank Group project that has supported the rapid scale-up and delivery of affordable, quality lighting products that are predominantly solar lanterns used for household lighting—nearly 7 million people had been reached as of 2015 (World Bank 2015). Subsequently, the World Bank provided similar support outside of Africa—in Bangladesh, India, and Papua New Guinea, with more programs being developed in Indonesia and Pakistan. The World Bank and International Finance Corporation’s Lighting Africa and Lighting Asia programs and the successor program, Lighting Global,<sup>1</sup> pioneered well-designed and targeted technical assistance for improving quality assurance and service delivery (World Bank 2016).

Scaling Solar, an International Finance Corporation–led Bank Group program, provides governments with electricity supply solutions. Scaling Solar brings together several Bank Group services under a single engagement.<sup>2</sup> Scaling Solar offers advice, simple and rapid tendering, fully developed templates, competitive financing and insurance, and risk management and credit enhancement. It is designed to address the challenges of scaling up; for example, limited institutional capacity, lack of scale, lack of competition, high transaction costs, and high perceived risk.

Future efforts by the Bank Group to increase the use of disruptive and transformative technologies can benefit from studying these programs and identifying ways to overcome the challenges that scaling up typically poses. World Bank (2016) notes that “despite some significant pilot examples of micro-grid and mini-grid project components supported by the World Bank Group and in the private sector, scaling up continues to pose a challenge – in terms of institutional arrangements and for commercially viable business

models.” More generally, Cull and McKenzie (2020) summarize scaling-up challenges as follows: (i) small-scale pilots may concentrate efforts on those who benefit most, but scaling up may involve a loosening of eligibility criteria, and/or smaller effects on new areas; (ii) implementation and political economy issues can arise as programs grow (monitoring and implementation becomes more difficult at a larger scale, possibly subject to lower capacity and vested interests); and (iii) general equilibrium effects can further reduce some impacts; for example, training a small number of workers to find new jobs may be successful, while expanding training to additional workers may generate competition among the workers for the available jobs with a lower impact on overall employment.

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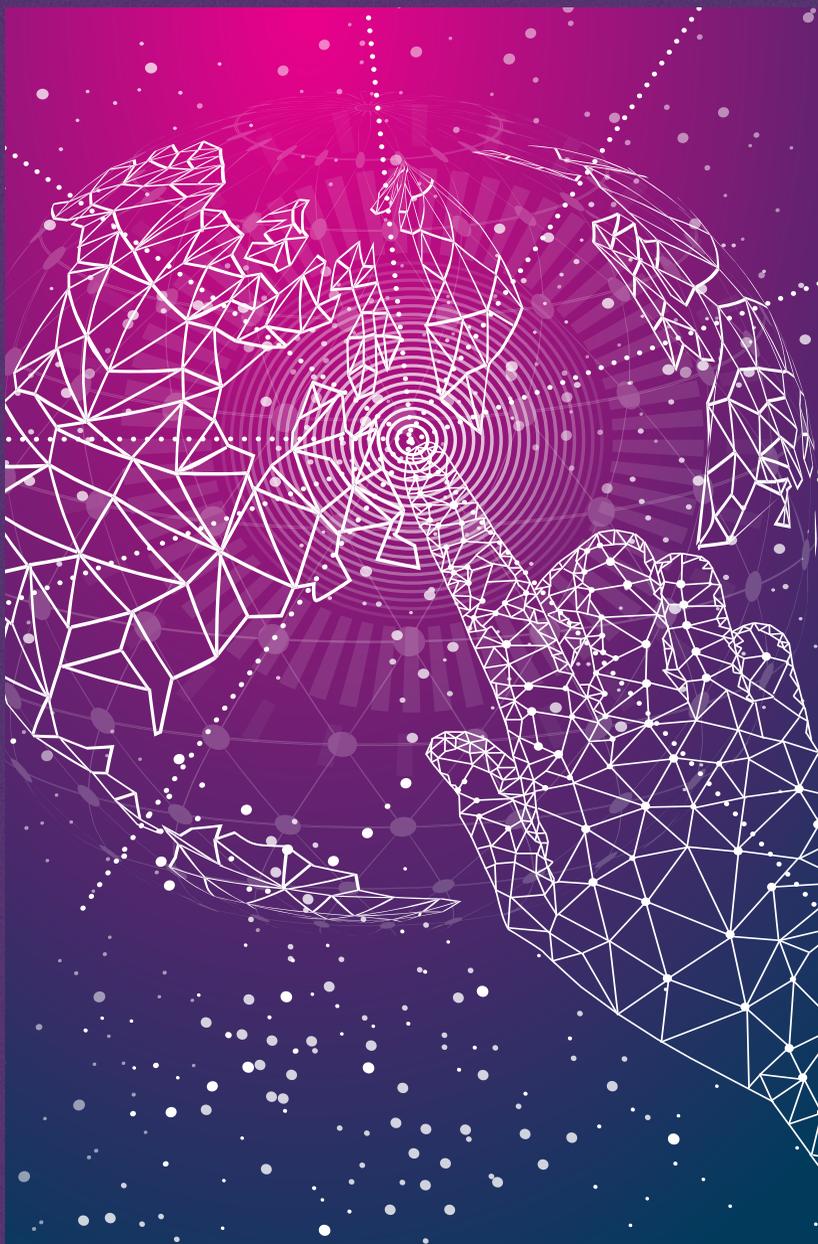
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<sup>1</sup> <https://www.lightingglobal.org/about>.

<sup>2</sup> <https://www.scalingsolar.org>.





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