SDG DIGITAL INVESTMENT FRAMEWORK

A Whole-of-Government Approach to Investing in Digital Technologies to Achieve the SDGs

Global Call to Action

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ITU

dial Digital Impact Alliance

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About ITU

ITU is the United Nations specialized agency for information and communication technologies (ICTs). ITU allocates global radio spectrum and satellite orbits, develops the technical standards that ensure networks and technologies seamlessly interconnect, and strives to improve access to ICTs to underserved communities worldwide. ITU supports countries in implementing digital transformation projects to harness ICT for SDGs.

About DIAL

DIAL aims to realize a more inclusive digital society in emerging markets, in which all women, men and children benefit from life-enhancing, mobile-based digital services. A partnership among USAID, the Bill & Melinda Gates Foundation, the Swedish government, and the United Nations Foundation, DIAL helps accelerate the collective efforts of government, industry and NGOs to realize this vision.
DIAL is staffed by a global team and is guided by a board of leading emerging market entrepreneurs, technologists and development experts. With this leadership, DIAL is uniquely positioned to serve as a neutral broker, bringing together government, industry and other development stakeholders to promote new solutions to old problems. For more information about the Digital Impact Alliance or this paper, please visit our website: www.digitalimpactalliance.org

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Introduction

UN Secretary-General António Guterres established the High-level Panel on Digital Cooperation in July 2018 to "realize the transformational potential of digital technologies" by accelerating cooperation. This panel signals the UN's recognition that digital technologies are required to achieve the Sustainable Development Goals (SDGs) by 2030. However, policymakers still have many questions: "Which digital technologies matter most?" "Where do we invest first (e.g., national identification, data privacy)?" "How should we manage legacy information systems?" To support government efforts to address these questions, the ITU and DIAL have developed a methodology and call to action to inform global digital investment.

This paper calls for countries to take a whole-of-government approach to investing in digital technology. It illustrates how the methodology developed can be used to identify which technologies matter most to achieve the SDGs. It highlights the use cases that have been implemented; the digital technology infrastructure and building blocks needed to deliver education, health and agricultural services; and where these can be shared across sectors to increase impact and reduce costs. Finally, it calls on governments and the private sector to work together to fund and deliver the digital solutions required to meet the goals.

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A whole-of-government approach to digital investments to achieve the SDGs

The SDGs promise to "transform our world" by 2030. Innovative uses of information and communications technologies (ICTs) have the potential to propel government programs to far greater effectiveness and scale, accelerating progress toward the SDGs. Global development agencies have invested billions of dollars over the past decade to ride this wave and integrate government programming with digital technology. In 2015, the Department for International Development (DFID) reported investments in more than 1,800 mobile for development (M4D) apps and services that had been launched and funded more than 160 programs with significant digital elements. Conservative estimates from the Bill & Melinda Gates Foundation place its digital investments at $500 million. These two donors are not unique in maintaining a growing portfolio of digital investments.

Despite significant investment, we have not seen ubiquitous scale either in software platforms or data use, and we have not seen commercial software providers appreciably adjusting their product design to meet the SDGs. A key reason for this is that digital investments, like global development investments in general, are most often siloed by sector, resulting in significant fragmentation and duplication of efforts. This makes it difficult for governments to understand where there are common products that could be used and disincentivizes technology providers from building these products, as the market size seems too small.

Exacerbating the problem is the fact that ICT investments in low-income countries have often been driven by donors, who work within constricted timelines and are often guided by specific sector (e.g., agriculture, education) needs, which deprioritizes reuse, integration and scalability in favor of short-term, sector-level results. These issues actually increase overall costs and limit the number of ICT applications that build sufficient momentum to develop into

broadly reusable software platforms. Most critically, these ICT investments have not been made to address the end-to-end needs of government programs that work to make a real difference in people's lives, leaving governments to determine how to integrate multiple, often fragmented technologies.

There is growing support for and evidence of governments taking a whole-of-government approach to investing in digital infrastructure that can deliver digital services at scale with a greater return on investment (ROI). The whole-of-government approach refers to a cross-sector and cross-organizational consideration of individuals' needs to delivering services in a more integrated and coordinated manner. Limited resources require a holistic architectural approach that takes advantage of economies of scale that are not available to ICT implemented in a piecemeal fashion. Evidence from countries as diverse as India and Estonia illustrates how a whole-of-government approach to investing in shared digital infrastructure can lead to a more rapid scale-up of development services with strong protection for citizens' rights at a fraction of the cost.[1]

In 2018, India published its government enterprise architecture, IndEA, which defined a whole-of-government approach to delivering common services throughout the public sector mapped to the SDGs.[2] The IndEA framework guides investment in digital public goods, which are centrally administered digital infrastructure and applications available to all sectors. A prime example is India's national identification system, called Aadhaar, that was launched in 2009 and had 1.21 billion subscribers as of 2018. Aadhaar stimulated the growth of India's digital economy, enabling digital payments of $57 billion since its introduction and saving the government $13 billion in reduced transaction overhead.[3] A World Bank study showed that digital identification implemented as a public good yielded a significant net positive return on investment in a large variety of development services (e.g., banking, health).

The whole-of-government approach to digital infrastructure taken by India has provided a model for other countries. For example, Rwanda, under its Vision 2020 strategy, began a modernization campaign to digitize its economy and empower its middle class. A key component of the program is to move to a cashless economy, which the government aims to achieve through ubiquitous mobile phone penetration and high-speed internet access. To achieve this ambitious goal, four years ago it joined the Better Than Cash Alliance, a global partnership committed to moving from cash to digital payments. Rwanda is already realizing increased efficiency and revenue by eliminating the cost of collection and other expenses. Perhaps most importantly, it has hosted its second conference to share best practices with others who are interested in pursuing a similar

[1] Saha. "Realizing SDGs with Government Enterprise Architecture." Accessed on September 1, 2018.
[2] Ministry of Electronics and Information Technology, Government of India. IndEA: India Enterprise Architecture Framework
[3] Nandan Nilekani. "India's Inclusive Internet." Foreign Affairs. September/October 2018. https://www.foreignaffairs.com/articles/asia/2018-08-13/data-people# Accessed on September 1, 2018.

path. At its last convening, representatives from Sierra Leone, Malawi, Paraguay, India, Ghana, Côte d'Ivoire, Papua New Guinea and Nepal learned about Rwanda's experiences and took back lessons to their own countries. Still other countries have launched digital investment campaigns to drive sustainable community and rural development. For example, Niger's Smart Villages initiative aims to increase national cellular and internet coverage to 100 percent to catalyze rural development in agriculture, commerce, education, finance and health.

Recognizing that many countries lack the technical roadmap, economic justification and human resources required to emulate the sophisticated enterprise architecture approach employed in India, ITU and DIAL developed this SDG Digital Investment Framework to identify and prioritize an initial set of shared ICT services that directly support national development priorities. The experiences gained through implementation of these shared ICT services provide a political, programmatic and technical basis for gradually building the governance mechanisms, human capacity and infrastructure needed to support the transition toward a digital economy. For countries that are further along the digital transformation pathway, this framework can be used to strengthen an emerging or existing application architecture by optimizing for the delivery of priority SDG use cases using ICT building blocks.

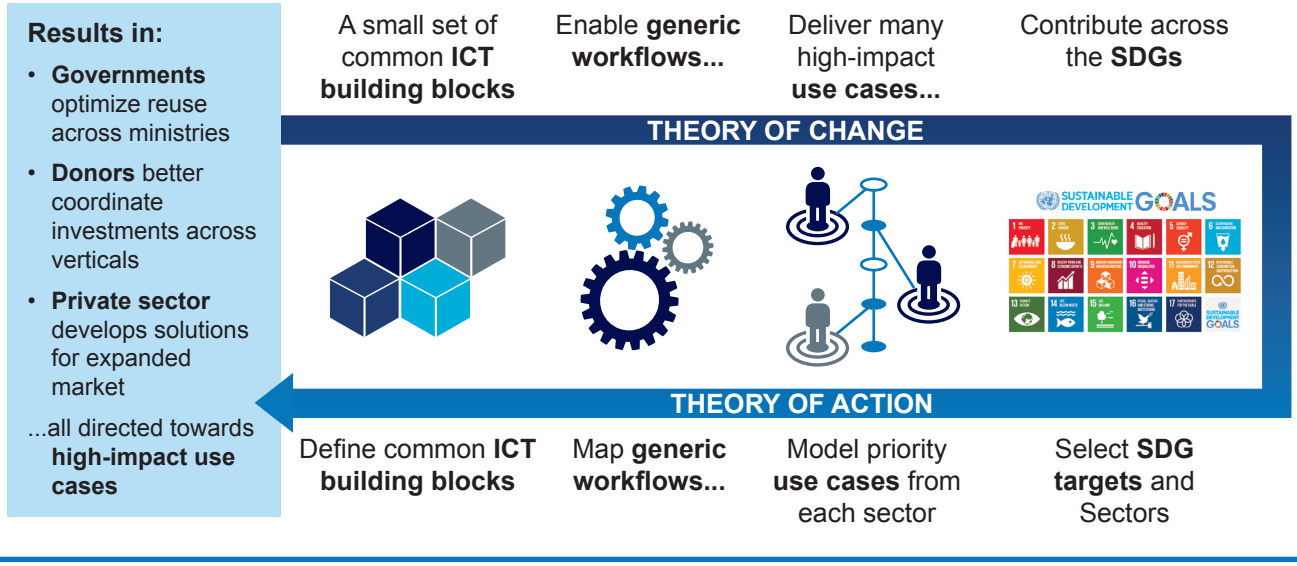
What is the SDG Digital Investment Framework?

The SDG Digital Investment Framework helps policymakers identify reusable ICT building blocks (e.g., ID, messaging and payment services) that can deliver priority SDG use cases (e.g., enroll a student, provide crop information) as depicted in Figure 1. A key tenet of the framework is that there are recurring business processes across the SDGs that common ICT services can support and multiple sectors can invest in and share. For example, providing digital subsidy payments to rural farmers to purchase seed relies on many of the same underlying technologies as delivering an electronic voucher to a parent to purchase school supplies and textbooks. National governments can prioritize use cases according to citizens' needs (e.g., improve neonatal outcomes), map functionality across sectors, and then invest in comprehensive infrastructure comprised of reusable software components, called ICT building blocks.

Investing in reusable ICT building blocks increases efficiency and delivers a higher ROI for governments. It also creates a platform ecosystem that provides incentives for a higher volume of application developers. Combining functionality in this way can also attract higher investments. These investments will in turn

FIGURE 1

SDG Digital Investment Framework Theory of Change



provide incentives for the private sector to fill the emerging cross-sector market demand and, critically, to extend services to populations that could not otherwise pay for them. The goals of the framework by stakeholder type are outlined in Figure 2.

Using the approach described above, we can show how a common set of ICT building blocks can be employed to deliver priority use cases within multiple sectors. Consider SDG Target 3.1: End all forms of malnutrition by 2030. Studies have demonstrated that periodic educational information and reminders customized to a child's age and weight sent to a parent's mobile device via text message or interactive voice response can improve infant and child nutrition. Text messages or phone calls can also be used to coordinate health worker follow-up. This intervention represents a nutrition use case that can be delivered by a sector-agnostic or generic workflow to send

FIGURE 2

Goals of the SDG Digital Investment Framework by Stakeholder Type

STAKEHOLDER	GOAL	RESULT
Citizens	More integrated, equitable and effective development programs and inclusion of a wider range of citizens in economic and societal progress	The lives of significantly more citizens are improved
Governments	Support a whole-of-government, architecture-based approach to minimizing total cost of ownership while maximizing ROI and cost-effectiveness of their digital investments in support of SDGs	Increased government ownership of ICT4D and related infrastructure, willingness to support development of enterprise platforms capable of supporting cross-sector applications
Technology Providers	Provide a roadmap for developers depicting what cross-sector functions should be developed and what interoperability requirements are needed in order to support integrated end-to-end service delivery	End of fragmentation and small scale, dead-end pilots; rollout of enterprise platforms that facilitate rapid scaling where appropriate, access to expanded market, and quicker time to market for new services and sustainable support infrastructure
NGOs and Implementing Partners	Provide NGOs and implementing partners with integrated offerings to address the end-to-end needs of government programs	Simplified procurement processes, lower costs through volume pricing, secure data management and improved reporting
Donors	Provide a strategic framework for coordinated cross-sector investment that increases ROI and cost-effectiveness	Ability to leverage ICT infrastructure across investment portfolios and to scale up multiple programs

FIGURE 3

Example of Reuse of ICT Building Blocks to Deliver Use Cases for SDGs 2, 3 and 6

SDG	2 ZERO HUNGER	3 GOOD HEALTH AND WELL-BEING	6 CLEAN WATER AND SANITATION
SDG Target	2.2 By 2030, end all forms of malnutrition; address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons	3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births	6.b Support and strengthen the participation of local communities in improving water and sanitation management
Example Use Case (one of many)	Send periodic nutrition information to parents based on child's weight and age and have health worker follow-up	Send periodic health tips to a pregnant woman based on stage of pregnancy and have health worker follow-up	Send periodic information regarding hygiene to individuals based on new sources of water, latrines, etc.
Example Workflow (one of many)	Based on user status, send predefined messages at scheduled intervals and schedule appropriate resource follow-up	Based on user status, send predefined messages at scheduled intervals and schedule appropriate resource follow-up	Based on user status, send predefined messages at scheduled intervals and schedule appropriate resource follow-up
Example ICT Building Blocks	Messaging Service Scheduling Service Shared Data Repository Workflow Service	Messaging Service Scheduling Service Shared Data Repository Workflow Service	Messaging Service Scheduling Service Shared Data Repository Workflow Service

FIGURE 4

Illustration of Savings Through Reusable Digital Investment Approach

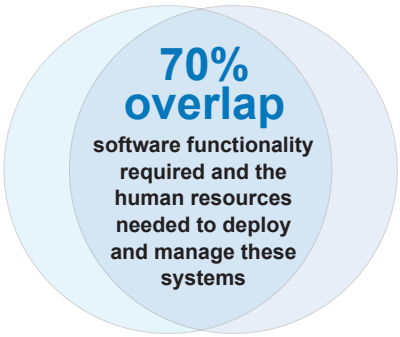
Imagine you are a head of state in a low-income country trying to justify committing to funding large-scale, sustainable ICT infrastructure capable of supporting a large number of programs across a wide variety of sectors. Your hypothetical arguments might look like this:

You have **14 digital pilot projects**

across three sectors
(health, agriculture and education)
in your country,

which **serve 7,000 people.**

12/14 projects:



Total donor investment
$6,000,000

Average cost
$857/person

Total cohort, at scale
1,000,000 people

Cost of scaling projects
$857,000,000

Projects deployed using
single set of shared ICT services:
Total investment required by donors
$2,000,000

vs

Projects deployed using
12 distinct ICT systems:
Total investment required by donors
$6,000,000

This would bring the cost from
$857 to $285 per person.

The total cost of scaling these efforts to 1,000,000 people goes from
$857,000,000 to $285,000,000.

This common platform can also support many other SDG-related programs, so the total cohort it could serve could be
5,000,000 people,
bringing the cost per person down to
$57 from $857.

Through consolidation, using a common application architecture that is both scalable and more sustainable

$857,000,000
to service **one-half of your population**

vs

$285,000,000
to service your **entire population**

predefined messages at scheduled intervals that are customized for each client and to schedule an appropriate human resource follow-up. This workflow could be delivered by a generic messaging service, a scheduling service, a workflow service and a shared data repository. While there are software components that support the nutrition intervention, including off-the-shelf or custom-built products specific to nutrition programs, using common ICT building blocks allows implementers to reuse the same technology for related needs in other use cases (e.g., sending a reminder to a farmer about crop insurance).

This reuse is how governments set the stage for digital transformation through an integrated, whole-of-government approach that maximizes ROI and iteratively builds up an application architecture in support of the SDGs. Figure 3 outlines how related use cases in nutrition, health, and water and sanitation rely on the same scheduled messaging and coordinated follow-up workflows, and, therefore, can reuse the same ICT building blocks. As government programming expands to additional SDGs, the same infrastructure may be applied to related use cases in agriculture, education, finance and other sectors, increasing the ROI even further. Figure 4 illustrates how leveraging common software infrastructure within many sectors and use cases results in significant cost savings and makes scale-up of multiple programs possible, extending both the reach and effectiveness of government programming.

Through analysis of use cases in health, agriculture and education, ITU and DIAL have developed a catalog of candidate ICT building blocks and workflows that are mapped to use cases and SDG targets. The results of an analysis of the Rural Advisory Service Use Case are summarized in Figure 5, which describes the key steps in the use case, the workflows employed to deliver those steps and the building blocks that enable each workflow. Similar analyses have been conducted on other priority SDG use cases. Using this catalog, a government administrator with knowledge of their country's development priorities could find an SDG target of interest and quickly identify the common workflows and ICT building blocks that could help deliver that target. The catalog could then be used to determine other priority use cases that the same set of building blocks and workflows could enable, which is the key to realizing increased ROI. Furthermore, the workflow descriptions and building block requirements in the catalog can be used to assess current business and digital infrastructure capabilities to inform subsequent investments and implementation approaches.

The preliminary list of candidate ICT building blocks is shown in Figure 6. While some ICT building blocks listed here are new and represent innovative or emerging ICT approaches, most already exist for specific sectors or use cases. These existing technologies are invaluable because they can serve as a technical foundation or inform the design for more generic solutions. The catalog of ICT building blocks will evolve as other use cases and sectors are considered to reflect new requirements and market dynamics.

As countries experiment with the methodology and the catalog of building blocks matures by incorporating priority use cases from additional sectors, stakeholders can use it to plan a whole-of-government approach to digital investments. The catalog is intended as a starting point to collaboratively define robust, cross-sector requirements that are linked to the delivery of priority SDG use cases. The full details of the catalog and the methodology for its development will be documented in a forthcoming report.

FIGURE 5

Model of the Rural Advisory Service Use Case and Its Workflows and ICT Building Blocks

SDG Target 2.3: Double the agricultural productivity and incomes of small-scale food producers

SDG Use Case: Rural Advisory Service

Key Steps in the Rural Advisory Service User Journey

- Raise program awareness
- Client enrollment
- Content generation
- Outreach and tele-consultations
- Service coordination and marketplace
- Community network and knowledge sharing
- Program monitoring

Workflows

Generic workflows are employed to perform specific steps in a user journey

- Client Case Management
- Client Communications
- Client Education
- Content Management
- Data Analytics & Business Intelligence
- Data Collection and Reporting
- Financial Services
- Identification and Registration
- Knowledge Management
- Marketplace
- Procurement
- Work Planning and Coordination

Building Blocks

ICT building blocks are combined to enable specific workflows for a particular case

- Messaging Service
- Data Collection Tools
- e-Learning
- e-Marketplace
- Geographic Information Service
- Identification Service
- Information Mediator Service
- Payments Service
- Registration Service
- Reporting and Dashboards
- Scheduling Service
- Security Service
- Shared Data Repository
- Terminology Service

FIGURE 6

Summary of Candidates for ICT Building Blocks from Health, Agriculture and Education

- **Analytics and Business Intelligence Services** - Provides data-driven insights about business processes, performance and predictive modelling.
- **Artificial Intelligence Services** - Machine intelligence capabilities packaged as reusable services to perform work, extract insights from data and provide other business capabilities.
- **Client Case Management Services** - Registration or enrollment of a client and the longitudinal tracking of services for the client, often across multiple service categories, providers and locations.
- **Collaboration Management Services** - Enables multiple users to simultaneously access, modify and contribute to a single activity, such as content creation, through a unified access portal.
- **Consent Management Services** - Manages policies that allow users to determine the information that will be accessible to specific potential information consumers, for what purpose, for how long and whether it can be shared further.
- **Content Management Services** - Supports creating, editing, publishing and managing digital media and other information, often collaboratively.
- **Data Collection Services** - Supports data collection from human input, sensors and other systems through digital interfaces.
- **Digital Registries** - Centrally managed databases that uniquely identify and describe persons, service providers, facilities, procedures, products, sites and other entities related to an organization, industry or activity.
- **eLearning Services** - Supports facilitated or remote learning through digital interaction between educators and students.
- **eMarketplace Services** - Provides a digital marketing space where provider entities can electronically advertise and sell products and services to other entities (B2B) or end-customers.
- **Mobility Management Services** - Securely enables employee use and management of mobile devices and applications in a business context.
- **Geographical Information Services** - Provides functionality to identify, tag and analyze geographic locations of a region or object, such as a water source, building, mobile phone or medical commodity.
- **Identification and Authentication Services** - Enables unique identification and authentication of users, organizations and other entities.
- **Information Mediator Services** - Provides a gateway between external digital applications and other building blocks, thereby ensuring interoperability and implementation of standards, which is essential for integrating various building blocks and applications.
- **Messaging Services** - Facilitates notifications, alerts, and two-way communications between applications and communications services, including short message service (SMS), unstructured supplementary service data (USSD), interactive voice response (IVR), e-mail and social media platforms.
- **Payment Services** - Implements and logs financial transactions, such as insurance claims processing, product purchases and remittance of service fees, along with features for tracking costs and extracting audit trails.
- **Registration Services** - Records identifiers and other general information about a person, place or other entity, typically for the purpose of registration or enrollment in specific services or programs and tracking of that entity over time.
- **Reporting and Dashboard Services** - Provides prepackaged and custom presentations of data and summaries of key performance metrics of a business, often in visual formats.
- **Scheduling Services** - Provides an engine for setting up events or triggering specific tasks in an automated business process based on regular intervals or specific combinations of parameters.
- **Security Services** - Provides ICT administrators the ability to centrally configure and manage user and group access permissions to network resources, services, databases, applications and user devices.
- **Shared Data Repositories** - Common place to store data for a specified knowledge area utilized by external applications, such as a soil registry, often providing domain-specific functionality and data presentations.
- **Terminology Services** - Registry of definitions and terms with defined nomenclature standards, metadata, synonyms and, optionally, a knowledge map for a particular domain of knowledge (e.g., agriculture) used to facilitate semantic interoperability.
- **Workflow and Algorithm Services** - Helps to optimize business processes by specifying rules that govern the sequence of activities to be executed and associated type of information to be exchanged in order to orchestrate a process flow from its initiation to completion.

A Global Call To Action

The approach outlined in the SDG Digital Investment Framework will only happen with increased government ownership of digital public goods and the sustained commitment of donors, technology providers and implementing partners. As a community, we must take a whole-of-government approach to deploying integrated digital services to achieve the SDGs because the resources required to individually scale up siloed digital solutions are prohibitively high. We have outlined specific calls to action for each group of stakeholders to provide a roadmap for years to come.

1. We call on governments to take a whole-of-government approach to their national digital transformation efforts by implementing cross-sector digital services that employ reusable ICT building blocks.

To capitalize on this opportunity, we specifically call on governments to:

- Enact strategies to coordinate digital investments toward whole-of-government, architecture-based approaches to implementing shared ICT services, such as digital identification, e-Payment systems, digital registries and other ICT building blocks.
- Document and share learning experiences with other countries on a similar path, recognizing that innovation may come from countries with fewer legacy systems and policies.

To support this call, ITU and DIAL are seeking government partners to conduct in-country pilots using the investment framework to identify and plan shared ICT services across sectors. A core element of this will be tracking the cost savings of this approach. Pilots will provide a global reference example of how a cross-sector approach to technology products, policies, practices and people can accelerate digital services reaching the underserved more efficiently and effectively.

2. We call on donors to adopt a cross-sector digital investment framework into their global investment strategies.

In order to utilize a cross-sector investment approach to dramatically improve long-term ROI, we specifically call on donors to:

- Fund cross-sector country pilots to demonstrate the effectiveness and efficiency of architecture-based approaches to implementing reusable ICT building blocks in support of national development priorities.
- Support efforts to evaluate ROI and aggregate demand for digital services, strengthening the evidence base on which cross-sector digital investments lead to the greatest impact.
- Invest and participate in communities of practice that collaboratively define robust, cross-sector requirements for ICT building blocks and their linkages to service delivery value chains.
- Incorporate a whole-of-government approach to future ICT investments, even if a program is sector specific.

To support this call, ITU and DIAL will support donor collaboration and investment related to foundational research on aggregated demand for digital infrastructure and potential options for innovative financing mechanisms.

3. We call on technology vendors and implementing partners to respond to the emerging cross-sector market demand for ICTs to meet the SDGs by filling gaps in available technologies or adapting existing technologies based on ICT building block requirements.

We call on technology vendors and implementing partners to:

- Research and develop ICT products that meet cross-sector requirements and are interoperable, extensible and use existing standards when possible.
- Participate in global communities of practice, bringing specific expertise to collaboratively define robust, cross-sector requirements for generic ICT building blocks.
- Work with donors and countries to establish threshold pricing for varying demand levels, licensing terms and service level agreements that can inform pooled procurement.

To support this call, ITU and DIAL will work with technology providers to document common requirements for prioritized building blocks and provide engineering support to develop common standards and APIs that allow for interoperability between digital public goods.

4. We call on all stakeholders to join us in advancing the whole-of-government approach to digital investments into formal guidance for governments and their partners.

Specific cross-cutting calls to action include:

- Partner to incorporate additional SDG use cases and sectors into the framework and to build this approach into guidance materials for governments implementing a holistic, cross-sector approach to digital investment.
- Integrate established best practices for digital development and donor alignment into government or organizational commitments through the adoption of the Principles for Digital Development or related frameworks.
- Track cost savings and efficiency gains and make this data available to the global community to attract new investment.

Conclusion

Working together, governments, the private sector and donors can achieve the SDGs supported by a whole-of-government approach to deploying common, reusable ICT building blocks. This methodology is not simply an academic exercise, but rather a pragmatic response to the global community's challenges in understanding what technology is needed and how to scale it up to deliver citizen services efficiently, effectively and sustainably.

ITU and DIAL invite the global community's participation in the advancement and adoption of this framework and the forthcoming methodology. Our belief is that this approach will help governments make the right cross-sector digital investments that propel countries' efforts toward digital transformation and achievement of national development priorities.

2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
17 PARTNERSHIPS FOR THE GOALS
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
2 ZERO HUNGER
11 SUSTAINABLE CITIES AND COMMUNITIES
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

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