



# NATIONAL ICT ECOSYSTEM FRAMEWORK

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## **National ICT Ecosystem Framework**

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Philippine National Police

Philippine Network Operators Group

Philippine Society of IT Educators

Philippine Statistics Authority

SAP Software and Solutions

Securities Exchange Commission

Smart Communications, Inc.

Social Security System

Spark Philippines

STI College

Technical Education and Skills Development Authority

TXTPower

Union of Local Authorities of the Philippines

United Nations Development Programme

UP Electrical and Electronics Engineering Institute

UP Manila College of Medicine

USAID STRIDE Program

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Virtual Workforce

ZTE Philippines, Inc.

## MESSAGE FROM THE PRESIDENT



My warmest greetings to the Department of Information and Communications Technology as it launches the National ICT Ecosystem Framework (NICTEF).

Our country's progress is built upon a robust communication infrastructure system that integrates our economy and empowers communities across the archipelago. This groundwork maximizes the potential of information and communications technology (ICT) in fostering the development of our digital economy.

I welcome the NICTEF as it becomes the pioneer ICT initiative to synergize our diverse industries and operationalize emerging technologies. I trust that this framework will make industry development inclusive, create more jobs, empower the marginalized, promote transparency and accountability in government and bolster confidence in our economy.

I ask the business community, civil society and other stakeholders to join us in our efforts to fully implement the National ICT Ecosystem Framework so we may bring the integrative benefits of digital transformation to our people. I trust that you will uphold excellence, innovation and competitiveness as we strive for a brighter future for every Filipino.

I wish you a successful implementation of the NICTEF.

A handwritten signature in black ink, reading "Rodrigo Roa Duterte".

**RODRIGO ROA DUTERTE**

PRESIDENT  
Republic of the Philippines

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## MESSAGE FROM THE SECRETARY

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The Department of Information and Communications Technology (DICT) is in pursuit of an innovative digital economy that incentivizes progressive government transformation, sustained industry growth and dynamic people empowerment.

As an update to the Philippine Digital Strategy (PDS) 2011-2016, the National ICT Ecosystem Framework (NICTEF) harnesses emerging technological breakthroughs for improved public links, enhanced digital inclusion and accelerated economic growth by enriching various interactions as an ecosystem of integrated, interoperable and interconnected systems.

Through the NICTEF, the Philippines will be able to leverage key information and communications technology (ICT) trends in the Fourth Industrial Revolution (FIRe) while building infrastructure assets, promoting content development, and achieving prosperity for all - ensuring the realization of the Philippines' long-term vision called AmBisyon Nation 2040.

The conceptualization, formulation and crafting of NICTEF linchpins on a multi-stakeholder governance model towards an inclusive innovation perspective. Contextually relevant to the thrusts of the ASEAN ICT Masterplan (AIM) 2020, the Philippine Development Plan 2017-2022, and the Sustainable Development Goals (SDG), NICTEF is aimed at establishing a thriving, trusted and transformative knowledge society. The Framework is likewise poised to maximize the benefits of open governance, magnify the advantages of industry applications and multiply the opportunities of skills development.

The DICT's several plans, projects and programs make up the pieces of the puzzle that NICTEF intends to put together. This approach allows different actors to interact in synergy, designed for raising the country's rankings in terms of ICT use, adoption and development, while narrowing the digital divide. With NICTEF, the country rallies itself to be a digitally-empowered nation, continually transforming to foster growth in the digital economy.

A stylized, handwritten signature in black ink, appearing to read 'Eliseo M. Rio, Jr.'.

**ELISEO M. RIO, JR.**

ACTING SECRETARY

Department of Information and Communications Technology

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## MESSAGE FROM THE NATIONAL PRIVACY COMMISSION

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Congratulations to the Department of Information and Communications Technology on the successful launch of the country's National ICT Ecosystem Framework (NICTEF), the authoritative reference of the Philippine ICT landscape.

The NICTEF will provide the national ICT development agenda and serve as a blueprint for the harmonization and coordination of national ICT plans, programs, and projects. This framework holds utmost significance in the safe and secure delivery of goods and services in this data driven economy.

However, rapid advancement of technology does not come without risks due to increasing use and value of personal information. The growing complexity of ICT systems which involve personal information making it challenging for organizations to ensure privacy.

Data privacy requires the protection and preservation of the rights of the data subjects, as well as organizations' adherence to data privacy principles. With NICTEF, it is ensured that privacy is integrated into the national ICT ecosystem.

We laud this initiative of the DICT which will foster a sustainable and resilient technological society that will improve the quality of life for our country's citizens and residents.

To our DICT family, the National Privacy Commission is one with you in envisioning a future where the Philippines is a technological frontrunner in the global community.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Raymund Liboro', written over a thin horizontal line.

**RAYMUND ENRIQUEZ LIBORO**

PRIVACY COMMISSIONER AND CHAIRMAN  
National Privacy Commission

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## MESSAGE FROM THE INTERNET SOCIETY

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I would like to congratulate the Department of Information and Communications Technology (DICT) of the Republic of the Philippines for its efforts in the development of the National ICT Ecosystem Framework (NICTEF).

The DICT's commitment to following the multi-stakeholder model in the development of NICTEF is an exemplary approach that is a best practice for other countries to embrace.

Just as the Internet is open, interconnected and transnational, the multi-stakeholder approach gathers individuals and organizations from different sectors to share thoughts and ideas that contribute to policy development. This collaborative process encourages inclusivity and a wide variety of inputs that produce well informed outputs. This in turn helps with effective implementation.

The ICT environment in particular is highly dynamic, and constantly evolving. Specific issues affecting different stakeholders can only be addressed by a collaborative approach. The benefits of this approach are evident in how NICTEF has been shaped.

As the world rapidly embraces digital transformation, NICTEF will guide the development of the Philippine digital ecosystem and lay the foundation for all sectors to benefit from the use of ICTs.

ICTs—and the Internet—today connects systems, processes and most importantly, people across all walks of life. The adoption and implementation of NICTEF will help maximize the opportunities ICTs and the Internet provide for socio-economic development and go some way to improving the lives of people all across the Philippines.

A handwritten signature in black ink, appearing to read 'Rajnesh D. Singh'.

**RAJNESH D. SINGH**

CHIEF REGIONAL DIRECTOR, ASIA-PACIFIC REGIONAL BUREAU  
Internet Society

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# EXECUTIVE SUMMARY

Information and communication technologies (ICTs) have brought tremendous developmental benefits to the Philippine society. Yet, the nation is painfully aware that these benefits are unevenly distributed, and may in fact have led to growth that has not been inclusive to a certain extent.

Many thought it would be a simple exercise to bridge the digital divide. We recall that in 1982, in an unprecedented move, Time Magazine selected the "Person of the Year" to be a non-human – the personal computer; hence, it was called "Machine of the Year." In the Philippines, projects such as the "Personal Computers for Public Schools" of the Department of Trade and Industry are aimed at increasing the exposure of Filipinos to computing devices. However, with the advent of the internet, computer hands-on experience was no longer sufficient – one needed access to broadband networks and to relevant content.

With the dawning of the Fourth Industrial Revolution, marked by the rapid pace of technological changes transforming economic and social systems, digital divide continues to grow wider at an even faster rate.

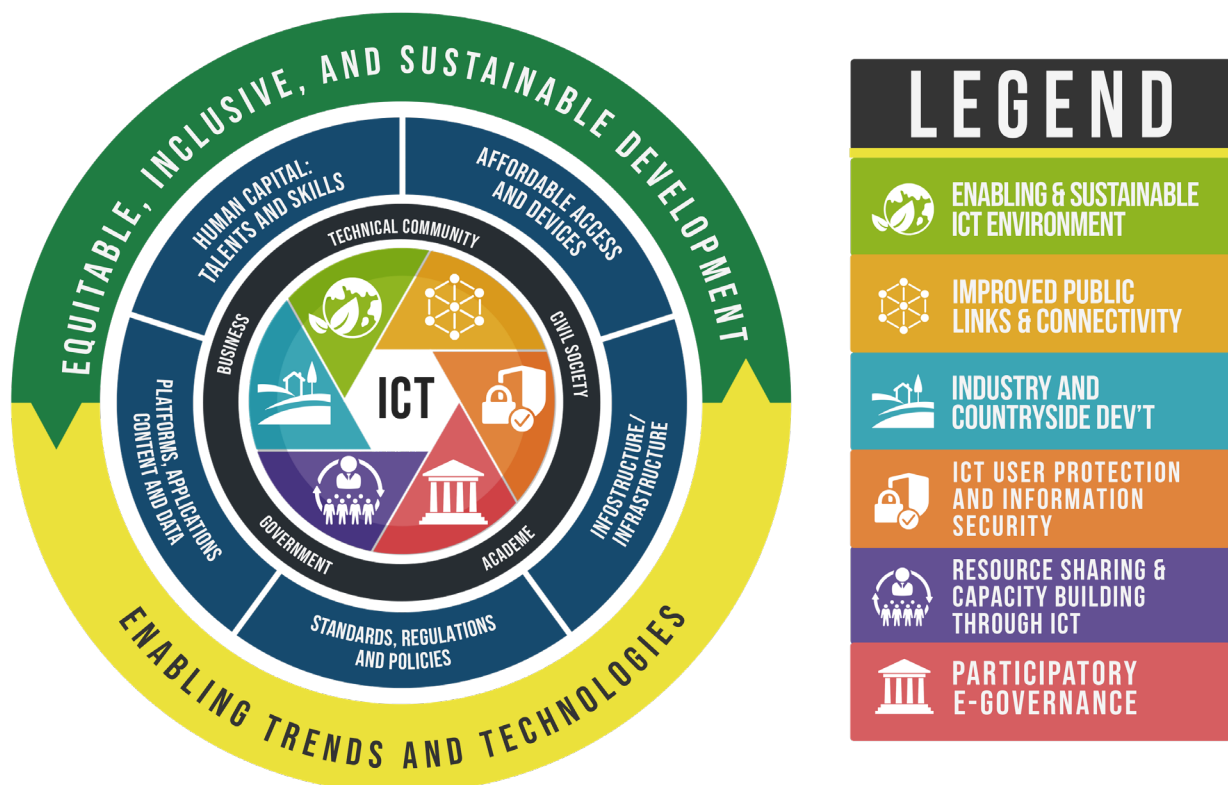
This revolution appears to be intensifying inequalities among communities that have the broadband infrastructure, resources and knowledge to reap the benefits of these intelligent technologies, leaving others further behind.

In order to bridge this diverse and growing digital divide, a multitude of approaches is needed. For some communities, there is a necessity to work on developing the attitude and aptitude of the society. In other areas, while there are passionate and educated users, they are unable to afford access. On the other hand, some communities may have educated users as well as affordable online access, yet the content that they need is not available. Thus, there is a need to take a multi-stakeholder approach in addressing the digital divide. It takes an ecosystem to make such an approach work, as no single player can address all possible facets of the digital divide: (i) Inadequate Skills and Mismatch of Competencies ; (ii) High Cost of Access and Devices; (iii) Disaggregated Platforms (Apps/Services, Data/Content); (iv) Lack of Infostructure; and (v) Outdated Standards, Regulations, and Policies.

To address these, the Department of Information and Communications Technology (DICT), being the primary policy, planning, coordinating, implementing, and administrative entity of the Executive Branch of the Philippine government that will plan, develop, and promote the national ICT development agenda, seeks not only to more substantively engage and provide for meaningful participation by a more diverse array of stakeholders, but also to foster inclusive, bottom-up initiatives by encouraging the stakeholders themselves to set the agenda, projects, and goals of the nation's new digital strategy. The National ICT Ecosystem Framework (NICTEF) is envisioned as a 'living document,' contributory to the realization of *an equitable, inclusive, and sustainable development for the nation*, with ongoing reviews and updates driven by inputs from stakeholders. Figure 1 shows a summary of the NICTEF vision including the enablers and strategies to achieve it.

Government, businesses, and civil society organizations have interdependent roles to play in this ecosystem. While it may not be possible to include all stakeholders in the process, the more inclusive and transparent the process is, then the more likely it is to produce workable outcomes and to engender the requisite trust and support of those outside the process, furthering dynamic and participatory e-governance.

**FIGURE 1. THE NATIONAL ICT ECOSYSTEM FRAMEWORK VISION**



In **Chapter 1: Introduction to the NICTEF**, the values and vision statement of the ICT Ecosystem are set out: “We belong to an ICT ecosystem that values innovation, sustainability, inclusiveness, adaptiveness and happiness. Empowered and inspired by the strategic trends in our robust ICT ecosystem, we envision equitable, inclusive, and sustainable development in our society, and improved quality of life for our country’s citizens and residents.”

In order for this vision to be achieved, it is not enough to just focus on one or two elements of the ecosystem. The NICTEF will therefore assist in determining whether the national ICT development agenda is properly balanced in addressing the previously enumerated elements of the ecosystem framework.

In **Chapter 2: Submission Process**, we describe the process for submitting projects to be included in the NICTEF. As mentioned above, it is important that all five elements of the framework are cohesively developed, so that if there are “gaps” identified, project proponents may then be encouraged to submit appropriate “gap-closing” projects for inclusion in the ICT Ecosystem Framework.

In **Chapter 3: Methodology**, we outline the multistakeholder approach that was used in developing the NICTEF. We also emphasize the importance of pursuing this approach going forward, as government, business, and civil society each has a role to play in this ecosystem.

In **Chapter 4: Strategic Trends in the ICT Ecosystem**, we identify the key drivers which may serve as enablers to accelerate the journey towards fulfilling the vision. As of today, these include technological advancements such as artificial intelligence, blockchain, fintech, and many others. Based on the current project inventory, there are six (6) projects that include artificial intelligence as an enabler, four (4) that involve blockchain, and (2) that have fintech as a component.

As new projects are added to the NICTEF, these numbers will continue to rise. In addition, when new trends are identified, this chapter can be updated to reflect the evolving nature of the ecosystem.

In **Chapter 5: Strategic Thrusts**, we lay out the strategic thrusts which will be promoted by NICTEF in order to achieve its vision. In this chapter, we also list down the plans, programs and projects (collectively referred to as the “projects”) classified according to the strategic thrust which they are focused on and the framework elements they have impact on. The strategic thrusts include:

- Participatory e-Governance which expedites greater efficiency in improved public service delivery, transparency and accountability;

- Industry and Countryside Development which promotes for a more efficient and thriving Philippine commerce and bringing ICT to the countryside;

- Resource Sharing and Capacity Building Through ICT which optimizes ICT to its fullest potential in various niches and promoting digital literacy;

- Improved Public Links and Connectivity which will ensure equal access to broadband services;

- ICT User Protection and Information Security which encompasses making sure that the entities, systems and processes involved are able to exchange ICT information in a safe and secure ICT environment; and

- Enabling and Sustainable ICT Environment which focuses on reducing the digital divide between gender groups and ensure that the benefits of ICT are evenly accessible to all and to combat environmental issues and to aid in promoting a sustainable development.

In **Chapter 6: Strategic Indicators**, we explore several indicators from well-respected global institutions which we intend to use to measure the progress of the entire ICT ecosystem. To date, we have included the following (and others may still be added in the future):

- Network Readiness Index (World Economic Forum),
- ICT Development Index (International Telecommunications Union),
- Digital Adoption Index (World Bank),
- Freedom on the Net Index (Freedom House),
- World Digital Competitiveness (IMD World Competitiveness Center),
- Affordability Drivers Index (Alliance for Affordable Internet),
- Inclusive Internet Index (Economist Intelligence Unit), and
- E-Government Development (United Nations).

Finally, in **Chapter 7: Moving Forward**, we present the actions that have been identified to disseminate the NICTEF and to ensure that the multistakeholder approach continues to serve as a guiding force. Furthermore, we outline the manner in which the NICTEF is envisioned to be updated on an annual basis, so that it truly is a “living document”.





# INTRODUCTION TO THE NICTEF

## 1.1 BACKGROUND

On 23 May 2016, Republic Act No. 10844, the “Department of Information and Communications Technology Act of 2015” was signed into law. Accordingly, the law states that the Department of ICT (DICT) shall henceforth be “the primary policy, planning, coordinating, implementing, and administrative entity of the Executive Branch of the government that will plan, develop, and promote the national ICT development agenda.”

Consistent with mandate of the Department to *“harmonize and coordinate all national ICT plans and initiatives,”* the DICT hereby promulgates the National ICT Ecosystem Framework (NICTEF) in order to promote the national ICT development agenda, and to serve as a blueprint for the harmonization and coordination of national ICT plans, programs, and projects.

## 1.2 THE NATIONAL ICT DEVELOPMENT AGENDA

Prior to the DICT's establishment, the role of ICT in nation building has been championed by several other, some predecessor, government agencies and instrumentalities:

From 1992 to 1998, the "**National Information Technology Plan for the 21st Century**" was made mainstream by the Department of Transportation and Communications (DOTC), the Department of Trade and Industry (DTI), and the National Computer Center (NCC). The plan envisioned the Philippines to be "a newly industrialized country" and "Asia's Knowledge Centre."

From 1998 to 2004, the "**e-Philippines Strategy**" and the "Government Information Systems Plan" were respectively advocated by the Information Technology and e-Commerce Council (ITECC) and the NCC. The former had a vision of "an electronically enabled society" while the latter envisaged to "harness the full potential of ICT to ensure wider public access to information and the faster and more efficient delivery of government services."

From 2006 to 2010, the "**Philippine Strategic ICT Roadmap**" was developed by the Commission on Information and Communications Technology (CICT). It sought to achieve the vision of "empowering the nation through ICT."

From 2011 to 2016, the "**Philippine Digital Strategy (PDS)**" was championed by the Information and Communications Technology Office (ICTO) of the Department of Science and Technology (DOST). The PDS had a vision of "a digitally empowered, innovative, globally competitive and prosperous society."

In light of all these, the nation strives to recognize the opportunities and the challenges of emerging technologies. While there had been numerous improvements and ongoing innovations in ICT, there still remains a huge part of the local populace that is not fully aware and is unable to enjoy its benefits. NICTEF builds on all of these strategies in unifying digital services and paving the way for a future-ready nation.

## 1.3 THE NATIONAL ICT ECOSYSTEM FRAMEWORK (NICTEF)

The government's linchpin role in embracing innovation builds upon ICT as the currency of the digital economy. And for this objective, the NICTEF will be an authoritative reference source, as well as a living document that shall be updated periodically with the latest plans, programs and projects, including recent indicators, accomplishments, outcomes and results.

The NICTEF also contextualizes strategies in light of connectivity masterplans and best practices to benchmark the pace of development within the region and identify trends and timelines to promote a holistic approach to the adoption of the ecosystem paradigm. The framework provides avenues to synchronize policy formulation, evolution of technology, and regulatory regimes to pave the ground for ICT inclusion in various government processes, and society in general. Centers of excellence and sectoral champions are identified to lead industry growth through compliance with global standards.

To synergize diverse industries and manage ICT for convergent platforms, it is high time that the Philippines adopt the NICTEF building upon its predecessor, the Philippine Digital Strategy (PDS) 2011-2016, as a complementary planning tool in fostering the development of a digital economy. It is with this sense of confidence that the administration advocates for trailblazing multi-disciplinary

innovation, operationalizing emerging technologies, and updating the ICT diaspora nationwide.

Taken together, the application of ICT in public administration, business management and participatory democracy is aimed into making the lives of the Filipinos more comfortable. With NICTEF, ICT as a tool shall empower the poor and marginalized, push for improved transparency and accountability in government and bolster confidence in our economy. We intend to make industry development inclusive, especially in the countryside, creating more jobs, making communities more resilient and putting in greater trust in society.

As the Philippines positions itself as a stronghold of innovation, the nation builds upon the experience of the multi-stakeholder process involving government, businesses, civil society and other sectors of the digital community, in harnessing their energies into bringing the integrative benefits of the digital economy to all citizens.

The following sections lay out the elements in the ICT ecosystem and the desired end state (Values, Vision and Mission Statement, Framework Elements).

## 1.4 VALUES, VISION AND MISSION STATEMENT

**VALUES** We belong to an ICT ecosystem that values innovation, sustainability, inclusiveness, adaptiveness and happiness.

**VISION** Empowered and inspired by the strategic trends in our robust ICT ecosystem, we envision equitable, inclusive, and sustainable development in our society, and improved quality of life for our country's citizens and residents.

**MISSION** We will achieve this by providing information and communication technologies that can be safely and securely used in digitally transforming the delivery of goods and services, researching and enabling ICT-driven innovations, fostering responsive and creative industries, and catalyzing participative communities of future-ready citizens and residents.

## 1.5 **FRAMEWORK ELEMENTS**

ICT is a game-changer, transforming the way people do things. Today, cities are dynamic societies powered by innovation and driven by knowledge. With this, the Department recognizes the challenges and opportunities that make up the framework elements. Indeed, as policy makers, industry champions and sector regulators, the government's role ranges from establishing integrated infostructures for connectivity and access, to promulgating rules that safeguard the interest of the public, while at the same time promoting ICT ecosystem development. At its core, the fundamental understanding of the critical role of the following elements is necessary in addressing increased demand for new jobs, socially established valuation metrics and updated industry policies. The National ICT Ecosystem is comprised of several interdependent framework elements:

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Human Capital: Talents and Skills – the individuals who access the applications, services, content and data that are provided by the players in the ICT ecosystem.

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Affordable Access and Devices – the interfaces through which humans access the applications, services, content and data – these may include wearable devices, cellphones, laptops, desktop computers, internet cafes, and other similar devices or venues.

- Platforms (Apps/Services and Content/Data) – these are the solutions (or portions of a solution) which are accessed by users in the ecosystem in order to achieve equitable, inclusive, and sustainable development in our society, and potentially to improve their quality of life.
- Infostructure/Infrastructure – these are the physical and logical components which collectively perform the function of providing secure connectivity between the users, their devices, and the platform which they are accessing.
- Standards, Regulations and Policies – these provide the boundaries which will allow for the players and elements within the ecosystem to safely and productively inter-connect and inter-operate.

Indeed, the plans, programs and projects in NICTEF shall build economies of scale and scope while anchored on the innovations brought about by cross-cutting application of ICT in various sectors of society. Global best practices are then needed to be localized to fit consumer demands peculiar to a demographic region, such as the emergence of the latest wireless technologies. It is then imperative for us to have a benchmark understanding of the implications of policies governing the framework elements, harmonization of various services, and availability of new applications.

In order for the vision and mission to be achieved, it is imperative that all of these framework elements be cohesively developed. It is not enough to just focus on one or two elements of the ecosystem. For example, some individuals may have the means and opportunity to access the internet but may not have the ability to use the content and services provided to them. In a different part of the country, users may be hungry for content on increasing agriculture productivity but may not have an affordable and reliable means of accessing the appropriate platforms.

Enjoining the stakeholders is key to realizing the vision of a shared understanding on ICT ecosystem development with emphasis on bridging the digital divide. This is most apparent in promoting innovative interventions through policy and regulation addressing society's technology gaps and inequalities. The NICTEF will therefore assist in determining whether the national ICT development agenda is adequately addressed by embracing adaptive trends and strategies that are enabled by the five framework elements of the national ICT ecosystem.

**FIGURE 2. THE FIVE FRAMEWORK ELEMENTS**





# SUBMISSION PROCESS

The National ICT Planning, Policy and Standards Bureau (NIPPSB) of the DICT, responsible for the formulation of government-wide policies, plans, programs, and standards on ICT matters, will accept submission of project profiles from government agencies, private sector companies, and civil society organizations. Inclusion in the NICTEF will provide greater visibility for the project proponents, which may assist in promoting the project to a wider audience of potential partners, funders, customers and beneficiaries.

Inclusion in the NICTEF will also enable the DICT to provide recognition of diverse efforts within the ecosystem, and to harmonize such efforts in order to avoid unnecessary overlaps. Finally, the NICTEF project profiles will help the DICT to analyze if all strategic thrusts and framework elements are covered, or if not, to identify where gaps exist so that resources may be properly allocated. This allows the DICT to ensure that the NICTEF continues to be responsive to the trends, and relevant to the needs, of the ecosystem, and that the projects in the NICTEF are aligned with the aforementioned values, vision, and mission statements.

Submissions will be screened by the CIO Council (RA No. 10844, Section 13, Chief Information Officer Council) and the Sectoral and Industry Task Force (RA No. 10844, Section 14, Sectoral and Industry Task Forces). An additional source of project submissions related to ICT may also be sourced from the National Economic Development Authority, the government agency tasked with monitoring and coordinating projects for the Philippine Development Plan 2016-2022.

Please refer to Appendix C for a sample submission form. A downloadable version of this form will be made available on the NICTEF website.



# METHODOLOGY

## 3.1 BACKGROUND AND RATIONALE

The Philippines has had a history and extensive practice of public consultations. For government agencies, these are often mandated by law as in, for example, the Public Telecommunications Policy Act RA 7925 which in Section 6 states in part that – *“d.) the operation of a national consultative forum to facilitate interaction amongst the telecommunications industries, user groups, academic and research institutions in the airing and resolution of important issues in the field of communications.”*

Going beyond the open public consultations that the DICT’s predecessors utilized in crafting prior versions of the Philippine Digital Strategy (PDS), the DICT now seeks to both deepen and widen meaningful stakeholder engagement in its processes, particularly and immediately for the drafting of the National ICT Ecosystem Framework (NICTEF), for the following reasons:

- ICTs particularly the Internet are now so pervasive that decisions, strategies and policies impact a highly varied and distributed range of people and interests;
- Overlapping rights and responsibilities across sectors should be recognized and addressed as early as possible in the process;
- Need to synergize different forms of expertise, such as technical, policy and developmental; and

Constructive engagement and involvement in the policy-making and strategy formulation process provides legitimacy and acceptance of decisions which positively impacts subsequent implementation.

In order to adequately address these considerations, one may look to the Internet itself. The emergence and continuing dynamic evolution of the Internet over the decades serves as real-world proof of concept for multistakeholder processes. As the Internet has grown more pervasive and as it continues to affect more stakeholders and various aspects of life, multistakeholder development and governance processes have proven to be sufficiently adaptive and inclusive, thereby enabling the continuing utility of the Internet and the various applications enabled by it.

By adopting globally-recognized multistakeholder practices the DICT endeavors to:

- Maximize inclusiveness and transparency;
- Foster consensus-driven outcomes and collective responsibility;
- Enable effective decision-making and implementation; and
- Enhance collaboration through distributed and interoperable governance.

With the augmentation of its policy development process utilizing multistakeholder praxis, the DICT seeks not only to more substantively engage and provide for meaningful participation by a more diverse array of stakeholders, but also to foster inclusive, bottom-up initiatives by encouraging the stakeholders themselves to set the agenda, projects, and goals of the nation's digital strategy. And while it may not be possible to include all stakeholders in the process, the more inclusive and transparent the process is, then the more likely it

is to produce workable outcomes and to engender the requisite trust and support of those outside the process. Furthering dynamic and participatory e-governance, the NICTEF is also envisioned as a 'living document', with ongoing reviews and updates driven by inputs from stakeholders.

In this and its other developmental processes the DICT shall continue to:

- Provide a neutral space and expertise where various sectors can come together to coordinate and collaborate, in order to work through ICT-related issues and challenges;
- Build capacity in order to provide stakeholders with the knowledge and skills needed to participate actively and effectively in processes towards the utilization of ICTs for nation building;
- Encourage the engagement of and support from various communities for open and inclusive multistakeholder models, processes and practices.

In **Appendix D – Multistakeholder Activities**, we have described the various stages and components in the development of the National ICT Ecosystem Framework (NICTEF), which include (1) Preliminary Activities, (2) Focus Group Discussions, (3) Regional Consultations, and (4) Additional Collaboration.

The outputs from these activities will also be made available on the NICTEF website.

## 3.2 CONTINUING MULTISTAKEHOLDER ENGAGEMENT AND EVOLUTION OF THE NICTEF

In order to ensure that the NICTEF retains its relevance and remains attuned to both evolving developmental requirements as well as dynamic innovation in ICTs, the DICT with its stakeholder partners shall maintain and engage in processes that allow for ongoing inputs to and periodic reviews of and revisions to the framework.

Thus, to further foster multistakeholder participation and operationalize the NICTEF as a living document, the DICT will:

- Setup and maintain a website to serve as a focal point for continuing review, assessment, tracking, revision and augmentation of NICTEF policies, plans and projects,
- Conduct periodic regional engagement activities to validate and adopt sector-specific result matrices that each sector or representative agency has identified in the projects on-boarded to NICTEF, and
- Validate and adopt measures being undertaken to leverage or improve utilization of ICTs by the sector organizations or relevant government agencies.





# STRATEGIC TRENDS IN THE ICT ECOSYSTEM

As they progress towards achieving the vision and mission laid out in Chapter 1, the players in the ICT ecosystem will most probably find themselves impacted by several trends that they will need to consider; some of these trends may serve as enablers and accelerate their journey, others may serve as blockers.

In keeping track with the interest of the public, plans, programs and projects are made inclusive as they are transformed into industry supported strategies. While there were instances that technology has outrun policy, what makes for a viable ecosystem for innovation and sustainable development lies on a framework of assessing strategies for standards formulation, best practices adoption, and cooperative communication. Our primary objective then is to map relevant ICT trends of key ICT projects to assess its alignment with the national ICT development agenda.

**TABLE 4.1. RELEVANT ICT TRENDS OF  
KEY ICT PROJECTS OF THE DICT**

| PROJECTS/PLANS/<br>PROGRAMS*                                | STRATEGIC TRENDS  |                         |          |                 |                    |            |             |              |                       |         |                    |                  |               |                   |
|-------------------------------------------------------------|-------------------|-------------------------|----------|-----------------|--------------------|------------|-------------|--------------|-----------------------|---------|--------------------|------------------|---------------|-------------------|
|                                                             | Fourth Industrial | Artificial Intelligence | Big Data | Cloud Computing | Internet of Things | Blockchain | 5G Networks | Smart Cities | Intelligent Transport | Fintech | Health Informatics | Cyber Resilience | Future Skills | Capacity Building |
| ACE 5-Star Compliance Program                               |                   |                         |          |                 |                    |            |             |              |                       |         |                    | X                | X             | X                 |
| Alternative Dispute Resolution for Data Privacy Complaints  |                   |                         |          |                 |                    |            |             |              |                       |         |                    | X                |               |                   |
| AskPRIVA (Chatbot for NPC PAID)                             | X                 | X                       | X        | X               |                    |            |             |              |                       |         |                    |                  |               |                   |
| Cybersecurity Management System                             | X                 | X                       |          |                 | X                  |            | X           |              |                       |         |                    | X                |               |                   |
| Data Privacy Awareness and Internet Safety Online Campaign  |                   |                         |          |                 |                    |            |             |              |                       |         |                    | X                | X             | X                 |
| Data Privacy Breach and Security Incident Reporting System  |                   |                         |          |                 |                    |            |             |              |                       |         |                    | X                |               |                   |
| Digital Literacy Training Project                           |                   | X                       |          |                 | X                  |            | X           | X            |                       |         | X                  |                  |               | X                 |
| Digital Terrestrial Television Broadcasting: Implementation | X                 |                         |          |                 |                    |            |             |              |                       |         |                    |                  |               | X                 |
| digitalcitiesPH                                             |                   |                         |          |                 | X                  | X          |             | X            |                       |         |                    |                  |               |                   |
| E-Government Masterplan 2022                                |                   |                         | X        | X               |                    | X          | X           |              |                       |         |                    |                  | X             |                   |
| Free Wi-Fi Internet Access in Public Places Project         | X                 |                         |          |                 | X                  |            | X           | X            |                       |         |                    | X                |               |                   |
| Government Network                                          | X                 |                         |          |                 | X                  |            |             |              |                       | X       |                    |                  |               |                   |

\* A short description of the projects is shown in Appendix A.

**TABLE 4.1. (CONT'D) RELEVANT ICT TRENDS OF  
KEY ICT PROJECTS OF THE DICT**

| PROJECTS/PLANS/<br>PROGRAMS*                             | STRATEGIC TRENDS  |                         |          |                 |                    |            |             |              |                       |         |                    |                  |               |                   |
|----------------------------------------------------------|-------------------|-------------------------|----------|-----------------|--------------------|------------|-------------|--------------|-----------------------|---------|--------------------|------------------|---------------|-------------------|
|                                                          | Fourth Industrial | Artificial Intelligence | Big Data | Cloud Computing | Internet of Things | Blockchain | 5G Networks | Smart Cities | Intelligent Transport | Fintech | Health Informatics | Cyber Resilience | Future Skills | Capacity Building |
| Government-wide Medium-term ICT Harmonization Initiative |                   |                         |          |                 |                    |            |             |              |                       |         |                    |                  | X             | X                 |
| Integrated Business Permits and Licensing System         |                   |                         |          |                 | X                  |            |             | X            |                       |         |                    |                  |               |                   |
| National Broadband Program                               |                   |                         | X        |                 | X                  |            | X           | X            | X                     |         |                    |                  |               |                   |
| National CyberSecurity Plan 2022                         | X                 |                         |          |                 | X                  | X          |             |              |                       |         |                    | X                | X             |                   |
| National Government Data Center (NGDC) Project           |                   |                         |          | X               |                    |            |             |              |                       |         |                    |                  |               |                   |
| National Government Portal                               | X                 |                         | X        | X               |                    |            |             |              |                       |         |                    | X                |               | X                 |
| Philippine Roadmap for 5G Technology                     | X                 |                         |          | X               | X                  |            | X           | X            |                       |         |                    |                  |               |                   |
| Rural Impact Sourcing                                    | X                 | X                       | X        |                 |                    |            |             |              |                       |         |                    |                  | X             | X                 |
| seedPH                                                   |                   | X                       |          | X               | X                  |            |             |              |                       |         |                    |                  | X             | X                 |
| Spectrum Roadmap                                         | X                 |                         |          |                 | X                  |            | X           | X            | X                     |         |                    |                  |               |                   |
| Stepping Up the Value Chain                              | X                 | X                       |          |                 | X                  |            |             |              |                       |         |                    |                  | X             | X                 |
| Women's ICT Development Index                            |                   |                         |          |                 | X                  |            |             |              |                       |         |                    |                  | X             | X                 |

\* A short description of the projects is shown in Appendix A.

In the remainder of this section, each of the trends is explored in more detail. When new trends are identified, this chapter can be updated to reflect the evolving nature of the ecosystem.

## 4.1 *FOURTH INDUSTRIAL REVOLUTION*

**KEYWORDS** fourth industrial revolution, 4IR, industry 4.0, globalization 4.0

The first industrial revolution began with industries powered by steam and water; in the second, electricity made mass production possible; the third one was the digital revolution; and this fourth revolution builds on the third but is characterized by a fusion of intelligent technologies. These technologies, such as **artificial intelligence (AI), big data analytics, blockchain, cloud computing, Internet of Things (IoT) and 5G networks** (described below) are blurring the lines between the physical, digital and biological spheres.<sup>1</sup>

The fourth industrial revolution is also marked by the unprecedented pace of technological changes that is transforming economic and social systems.

This revolution appears to be widening inequalities between advanced economies that have the broadband infrastructure, resources and knowledge to reap the benefits of these intelligent technologies, while those without are left further behind. Therefore fundamentally, accelerating the improvement of broadband availability, accessibility and affordability is a priority.

Within economies, inequalities are also widening between organizations and individuals with the capital and skills to harness the opportunities of the revolution and those without. These intelligent technologies are shifting management processes, business models, industry structures and sectoral boundaries. There is concern about the impact that these technologies could have on the security of livelihoods and earning power. Past revolutions confirm that new jobs

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<sup>1</sup> Klaus Schwab, "The Fourth Industrial Revolution: What it means, how to respond," World Economic Forum, 14 January 2016.

are usually created, but these disruptions often occur at the expense of lower-skilled workers who are unable to easily reskill and move into new sectors. It will be important to track workforce implications.

The effect of these technologies on social inclusion will need to be addressed. Policymakers will need to find ways to help those who are left behind. Transformations are likely to involve the development of new frameworks for national and multinational cooperation, as well as new models of education and targeted capacity building programs for reskilling and upskilling the workforce.

The fourth industrial revolution and the fusion of intelligent technologies are being used to achieve the United Nations Sustainable Development Goals and other agreements and frameworks, including the Paris Climate Agreement and the Sendai Framework for Disaster Risk Reduction, especially since the Philippines is highly vulnerable to climate change and disaster risks. It is vital that innovations in **fintech, health informatics, intelligent transport and smart cities** (described below) contribute to Philippines' advancement towards a sustainable, socially-inclusive and climate-resilient nation. Furthermore, the Philippines needs to strengthen its cyber resilience as a result of networks becoming more connected and the magnitude of cyberthreats rises.

## 4.2 ARTIFICIAL INTELLIGENCE

**KEYWORDS** artificial intelligence, AI, machine learning, robotics, chatbot, deep learning

AI is the simulation of human intelligence processes by machines, especially computer systems. These systems can learn to make decisions and predictions within specific contexts.

AI applications can perform a wide range of intelligent behaviors: optimization (e.g., supply chains); pattern recognition and detection (e.g., facial recognition, fraud detection); prediction and hypothesis testing (e.g., predicting disease outbreaks); and natural language processing (e.g., machine translation, spam filtering).<sup>2</sup>

There are four main components fueling the development of AI: big data, cloud computing, IoT, and fixed and mobile broadband, including 5G networks. IoT enables the collection and exchange of data such as biometric data, behavioral information and unstructured information through network-connected sensors and devices that operate mostly without human interventions. Broadband and 5G technologies enable data transmissions to data storage locations in the cloud. Cloud technologies also provide the computing power to run AI systems. The collected data, known as big data, is then used by AI systems to build up their intelligent capabilities. Each of these components is important on its own, but when aggregated and consolidated, the components can produce synergistic and transformative impacts, culminating into AI applications that bring new value.<sup>3</sup>

The AI systems use various advanced forms of statistical and mathematical models to process, learn from, and analyze the massive amount of data to gain insights, make decisions and predictions, or solve complex problems. Many AI systems use machine learning. Machine learning is the process in which a computer distills regularities from training data. For example, an AI system learns to identify spam in emails by exposing it to many examples of emails that are manually tagged as spam or not-spam. The AI system “learns” to identify patterns, like occurrence of certain words or combinations of words that determines the chance of an email being spam.

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2 International Development Research Centre, “Artificial intelligence and human development: White paper,” April 2018.

3 United Nations Economic and Social Commission for Asia and the Pacific, *Artificial Intelligence and Broadband Divide: State of ICT Connectivity in Asia and the Pacific 2017* (Bangkok, 2017).

AI is already enabling a wave of innovation across all sectors of the global economy, offering possibilities for boosting economic growth and tackling a wide variety of development challenges. Some examples include: increasing agricultural productivity through predictive analytics and on-the-spot diagnosis of crop diseases, analyzing healthcare data to facilitate scientific breakthroughs, reducing waste by predicting and identifying optimal production levels, improving early warnings of natural disasters, and enhancing citizen and customer services with the use of chatbots. Given the many potential applications of AI, there are substantial entrepreneurial opportunities. Efforts that focus on enabling enterprises to take advantage of the potential of AI, and supporting homegrown development and deployment of innovative AI applications for social good, will be vital.

At the same time, AI is being used to cause harm, undermine democratic governance and conduct unethical and criminal activity. AI is being used in cyberattacks,<sup>4</sup> and the creation of fabricated videos (or deepfakes) that uses a machine learning technique called "generative adversarial network" could threaten privacy, political unrest and national security, and lead to mistrust in major institutions and the media. Moreover, AI presents ethical, legal and accountability issues that need to be addressed. For instance, bias in the datasets or AI application could perpetuate existing inequalities and create unfair exclusions of underrepresented groups. Since AI processes large datasets that may include personal information, it could jeopardize the privacy of individuals, especially since advances in AI could potentially re-assign identity. Additionally, accountability could be obscured behind proprietary data and code. Questions around liability for the consequences of decisions that AI systems make, and how those harmed could seek redress need to be considered.

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4 AI is also being employed by cybersecurity professionals to develop new methods of defense and detection.

Therefore, policy and regulatory frameworks need to balance between enabling innovation while protecting privacy and security, in order to ensure that the AI applications are inclusive and fair. This is important given AI's potential to have widespread impact on decisions about individuals' access to services, employment and financial support. Issues of transparency in automated decision-making, control over one's own data and the opportunity for redress in cases of misuse or inappropriate outcomes need to be addressed. In addition, the impact of the adoption of AI on the employment market in the Philippines need to be monitored, particularly the impact of intelligent chatbots on business process outsourcing jobs.

## 4.3 BIG DATA

**KEYWORDS** big data, open data, metadata, personal data, anonymization, re-identification

Big data is a term used to refer to datasets that are too large and complex for traditional data-processing application software to deal with adequately.<sup>5</sup> Corporations are collecting all forms of data from mobile devices, software logs, sensor networks and other devices. The data collected includes every online search made, webpage visited, email or message sent, product or service purchased, leaving hundreds of thousands of electronic tracks about an individual. Tools are available to aggregate and analyze the data to reveal trends and associations. Big data has become a profitable commodity, as evident in targeted advertising, a multi-billion dollar business.

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<sup>5</sup> Wikipedia, "Big data," [https://en.wikipedia.org/wiki/Big\\_data](https://en.wikipedia.org/wiki/Big_data).

At the same time, big data is being used in innovative ways for social good. It can offer insights to determine the side-effects of drugs, optimize energy use, improve traffic control, and tackle other development issues. Mobile phone records have been used to track dengue fever for instance.

Most big data are in private hands – large telecommunications and Internet companies – that are reluctant to share their data. Public agencies may also be reluctant to share data. However, as part of the open government movement, governments are opening up their previously locked datasets on population, public budgets, education, health, housing, trade, etc. Open data is linked with stimulating research and development, and driving innovation through the use and re-use of data to address development problems.

These datasets may include individual records that threaten individual privacy if released openly. One of the most significant risks is the re-identification of de-identified data. A combination of policies and regulations that focus on data protection and privacy, and awareness raising is needed to protect individuals' privacy rights. Already, big data is being used by corporations to offer differential prices to consumers. It can be used by those in position of power to discriminate against specific groups, leading to denied access to services and employment, and harassment and violence. Big data has also been used for political targeting and influencing elections. Fundamentally, privacy is about individuals' ability to assert their rights in the face of significant power imbalances.

Additionally, it is vital to ensure responsible data practices and invest in improving data quality to ensure that they are inclusive, representative and trustworthy, which is critical to the success of AI systems. The value of data and the potential for use expands with quantity and quality.

Policies need to support wider sharing and use of data that spurs innovation, while recognizing the new risks and challenges it poses. The inclusive access to free, open, interoperable, anonymized and curated datasets will be crucial.

## 4.4 CLOUD COMPUTING

**KEYWORDS** cloud computing, data centers, infrastructure as a service, platform as a service, software as a service

Cloud computing is the delivery of on-demand computing resources from storage and computation to database and application services. These platforms, applications and databases are stored in large data centers, referred to as the cloud. Cloud computing is characterized by elasticity—the ability to scale up or down resources to meet variations in computing demands; pay-per-use—enabling users to pay only for the resources used; and self-service access. For organizations, cloud computing offers considerable savings because it requires little capital investments and maintenance expenses, and allows organizations to scale services with ease.

Cloud computing is being used to store data from IoT sensors and devices, process big data and develop AI applications. Cloud computing is being harnessed for a more efficient and integrated public sector. Small and medium enterprises also stand to benefit from the cost-effectiveness and flexibility of cloud solutions. Cloud computing could lower the upfront cost of using computing resources and services to ensure financial inclusion, roll out smart cities and intelligent transport initiatives, and improve health services. The lowering of upfront investment in ICT hardware and software could potentially open the playing field to innovative and alternative service startups and reach underserved segments of the market.

In the past few years, cloud computing has evolved from an emerging technology to an established networking solution that is gaining widespread acceptance and deployment. Enterprises and government organizations are moving from test environments to placing more of their mission-critical workloads into the cloud. Key barriers that are impeding the widespread adoption of cloud computing include a lack of awareness about the technology, data localization requirements, the cost and quality of the broadband infrastructure, privacy and security concerns, and the lack of common cloud standards across countries.<sup>6</sup> Another major concern regarding cloud computing is the high cost of maintaining data centers and their impact on climate change as they require significant electricity to power and keep equipment cool. Countries are exploring the use of renewable energy to power data centers.

## 4.5 INTERNET OF THINGS

**KEYWORDS** Internet of Things, IoT, Internet of Everything, smart devices, sensors, machine-to-machine

IoT is the rapidly expanding network of devices, sensors, physical objects, services and applications that communicate over the Internet, generating vast quantity of data from their surroundings that are then transmitted and analyzed to create insights and deliver social and economic benefits.

However, the increasing number of IoT devices raises potential security vulnerabilities and can expose user data to theft, particularly among poorly secured, unpatched and obsolete IoT devices. Compromised IoT systems can impact the security of its users, but it can also be used to launch attacks against third parties or other systems.

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<sup>6</sup> National University of Singapore and Microsoft, *A Cloud for Doing Good: A Technology Revolution for All in ASEAN* (2017).

IoT amplifies concerns about the potential increase of surveillance and tracking, and the amount of sensitive data that can be collected by devices operating in homes, businesses and public environments. Sometimes, these devices collect data about individuals without their knowledge or informed consent. In fact, IoT devices frequently have no user interface to configure privacy preferences.

As IoT-based initiatives such as smart cities and smart grid are developed and scaled, there will be a blurring of roles and responsibilities between the public and private sectors, including in the collection, storage and use of personal data. For these IoT initiatives, it will be a complex challenge to figure out which data protection rules would apply, who owns the data, and who bears the liability for any damage or harm caused to the user of an IoT technology.<sup>7</sup>

There is a need for policy, regulatory and technological interventions to ensure that manufacturers and suppliers of IoT products and services integrate privacy-by design and security-by-design principles, as well as ensure ongoing support to protect users throughout the device's (and the data's) lifecycle. At the same time, it will be crucial to empower IoT device owners with choices, tools and capabilities to take control of the collection and use of their personal information.

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<sup>7</sup> Internet Society, "Asia-Pacific Bureau Issue Paper: Internet of Things," November 2017.

## 4.6 BLOCKCHAIN

**KEYWORDS** blockchain, shared digital ledger, distributed digital ledger, decentralized digital ledger, cryptocurrency

Blockchain was first conceptualized through the release of Bitcoin, a cryptocurrency and decentralized payment system that operates independently of any central bank. Since then, this blockchain software has been reused and adapted for various applications in many sectors. Use cases include making financial disbursement more transparent and efficient, improving traceability across a supply chain, facilitating peer-to-peer clean energy trading among off-grid communities, and more.

Blockchain is a combination of technologies applied in a new way that includes databases, cryptography and hash technology, peer-to-peer networks and smart contracts. The database is sometimes referred to as a “ledger”, and blockchain is often described as a “distributed ledger technology” that records exchanges involving value, which can include money, goods, medical records, properties, land titles, even votes. As the term “distributed ledger technology” indicates, the ledger is distributed, which means that every network node stores an up-to-date copy of the ledger. This also means that the records in the ledger cannot in practice be easily erased or changed because it is replicated and distributed across the network. Blockchain, therefore, empowers individuals to transact on a peer-to-peer basis, allowing the co-creation of a permanent, unchangeable and transparent record of exchange, without having to rely on a central authority.

It is important to note that blockchain technology is not geared towards providing the actual service. Rather, it furnishes a secure, transparent and immutable record of transactions.

For example, with land titles, the relevant public entity still has to issue the title to the owner. This issuance, and a digital fingerprint or hash of the land title, can be recorded in the blockchain to show proof of ownership and title legitimacy. Fraud prevention or title alteration by third parties can be addressed this way.<sup>8</sup>

For blockchain to work, there are a number of prerequisites that need to be met, including accurate and reliable data, a public key infrastructure as blockchain relies on cryptographic tools, and the availability of skills to create blockchain applications. There are also challenges related to security and privacy. For instance, when a transaction has been accidentally or maliciously executed, it cannot be reverted by any single party. This raises the question of how—and to whom—to impute legal liability in blockchain-based systems, and how damage can be recovered when there is no central authority in charge of managing it. Regulations will need to lay out rules related to accountability and liability. The transparency of public blockchains also creates tensions with privacy principles as one can find all records on the blockchain using a particular key and they could be correlated to a particular profile.

Governance of blockchains is important but it is still unclear how stakeholders will influence and manage changes to the blockchain platform where there might be no central owner, as well as deal with malicious and illicit activities on blockchains, without stifling beneficial innovation. Regulatory sandboxes will be essential to allow emerging business models to move fast from proof of concept to delivery of results.

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<sup>8</sup> International Development Research Centre, *Unpacking the disruptive potential of blockchain technology for human development* (Ottawa, 2017).

## 4.7 5G NETWORKS

**KEYWORDS** 5G, fifth-generation network, mobile broadband, wireless networks

Broadband networks and technologies are the prerequisite for reaping the benefits of the fourth industrial revolution. 5G promises ultra-fast data transfer speeds, ultra-low latency and ultra-high reliability. Furthermore, with enhanced capacity to support large amount of data traffic and massive number of wireless connections, 5G will significantly enhance the broadband experience, and at the same time, enable a wide range of new wireless applications that integrate AI, big data, cloud computing, IoT and blockchain. With 5G, there will likely be a proliferation of use cases for smart cities and for various sectors.

The amount of data produced will correspondingly require more bandwidth and storage. Mobile networks will have to support the huge rise in data and there will need to be increasing investment in the ICT infrastructure. In addition to ensuring the resilience of the infrastructure, its environmental sustainability and impact on public health will also need to be considered.

Operators in several countries have announced commercial deployment of 5G before the end of 2018. As 5G systems reach the marketplace, spectrum availability is a crucial consideration. A globally harmonized spectrum has been key for the spread of 2G, 3G and 4G, and there is a need for spectrum harmonization between countries to reduce the cost and complexity of implementing and enabling 5G. Furthermore, the interoperability of connected devices through agreed-upon technical standards will be crucial to enable seamless communication and sharing of data.

## 4.8 SMART CITIES

**KEYWORDS** smart cities, sustainable cities, green cities

Our planet is increasingly urban, and cities are becoming nodes of innovation and productivity. However, factors like rising populations, rapid urbanization and climate change are putting increased pressure on cities, especially in the areas of governance, transportation, environment, energy, public safety and healthcare.

A smart city uses ICT to enhance its liveability, workability and sustainability.<sup>9</sup> A smart city increases the well-being and welfare of its citizens with the enabling power of technology, encouraging and facilitating its citizens' participation in physical and digital spaces.

There is a wide array of smart city applications being piloted. Generally, smart city applications collect data using sensors, devices or other systems, and send the data to an analytics system for real-time decision-making or future projections. Smart city initiatives can result in cost savings from operational efficiencies, new and better citizen experiences, and revenue growth from new products or services. Concerns include cybersecurity and data privacy risks, the "Big Brother" potential from mass and continuous surveillance, lack of skilled workers with expertise in smart technologies (including addressing security and privacy risks), upfront infrastructure investment cost, and interoperability with existing systems and devices.

Smart city initiatives require visionary leadership from local governments, as well as participation and partnerships with the private sector, civil society and academia to identify and prioritize needs that smart technologies can provide solutions.

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<sup>9</sup> Defined by Smart Cities Council.

This needs to be done in an integrated and holistic manner, as opposed to a siloed approach where individual departments build ad hoc applications with little regard for city-wide impacts and considerations to share costs, infrastructure and data.

Cities will need a resilient broadband infrastructure to support the smart city ecosystem. Ensuring inclusive access to this infrastructure will also be vital to ensure that all residents are able to benefit from the smart city applications. Another important prerequisite is cybersecurity. With Internet-connected sensors, cybersecurity solutions and applications are an absolute necessity as cyberattacks can disrupt critical infrastructure such as power and water supply. A well-trained workforce will be needed to secure the smart city ecosystem.

Moreover, an immense amount of data coming from the IoT sensors will need to be analyzed. City governments will need to strengthen their analytical capabilities. The data from IoT sensors could be incorporated in open data portals to drive innovation, and could be used for decision-making and city-wide development planning that is cross-sectoral and involves multiple stakeholders.

## 4.9 INTELLIGENT TRANSPORT

**KEYWORDS** intelligent transport, smart transport

Intelligent transport systems are being developed, often as part of smart city initiatives, to combat traffic congestion, air pollution and environmental degradation. IoT enables tracking of where people drive their vehicles, allowing AI applications to measure traffic in real time, monitor commuting statistics, and improve traffic planning and management. For example, intelligent traffic signals with dynamic

functioning can gauge the actual traffic in real time and adjust traffic lights based on vehicular volume. They are not static but adjust continuously throughout the day as conditions change. By adding the real-time element, they improve the efficiency of traffic flows and, as a result, help reduce congestion and improve air quality.

Real-time traffic data can also save time for commuters and enhance their commuting experience. This data can be provided in smartphone apps to help drivers determine the quickest traffic routes. Similar efficiencies have been derived from real-time public transport data. Many transportation authorities have placed their bus, ferry and train schedules online, which have reduced waiting time and increased usage of public transport services. Furthermore, in cities, the emergence of bike and car sharing, and e-hailing services are new business models that have improved urban mobility.

In addition, there are smartphone apps that help drivers find available parking places in congested urban areas. Sensors attached to individual parking spots can be integrated into geographic information systems and provide maps showing available parking spots. This means drivers do not have to circle the block aimlessly trying to find parking but can go directly to a free spot, thereby reducing traffic congestion, driving time and vehicular pollutants. Combined with smart metering systems, increased revenue can be generated from public parking efficiencies.

Many intelligent transport pilots have been rolled out and there are many options available, as described above, including intelligent traffic signals, real-time road navigation, real-time public transit information, smart parking, bike and car sharing, e-hailing and more. It is essential to adopt a holistic approach to transport planning and management, and strategically leverage digital technologies to improve mobility and equitable access to transport services, and at the same time reduce congestion, pollution, injury and death, as well as contribute to sustainable development, including health benefits.

## 4.10 FINTECH

**KEYWORDS** **fintech, financial technology, financial inclusion, digital finance**

Fintech is the use of ICT to provide financial services. Fintech has increased the efficiency of banking functions, and with the rapid growth in mobile phone adoption, it has also increased financial inclusion – providing the unbanked with access to loans and savings, transfer and payment services, insurance, investment management, and financial literacy. In the past decade, fintech has reduced costs (and therefore enhanced affordability), expanded the scale and deepened the reach of financial services, particularly to unserved and underserved groups, including women, the poor, farmers, and small and medium enterprises. There is global consensus that financial inclusion is a critical enabler and accelerator of poverty reduction, inclusive growth and entrepreneurship, and contributes to strengthen resilience to crises and disasters, and the effects of climate change.

Fintech contributes to financial inclusion as it can enable fast, low-cost and convenient customer identification and verification; address last-mile distribution and servicing issues through digitally-enabled points of physical access such as mobile phones and point-of-sale devices; enhance access to credit by using alternative sources of data such as payment transactions and telecoms data; and improve the ease of payments and savings.

The fintech landscape has expanded the group of financial service providers to include not only banks, microfinance institutions and insurance companies, but also mobile network operators, payment companies, and e-commerce and Internet companies.

These providers are coming up with new business models, as well as creating and offering innovative bundled products and services that are both financial and non-financial (e.g., the bundling of agricultural and financial services to farmers). The multi-providers have implications for regulators:

- Innovative digital financial services typically involve multiple providers that will be storing and managing customer data and funds. There may be risks related to real-time accuracy and reconcilability of records.
- When products are bundled, regulation and monitoring becomes more complicated, requiring coordination among regulators.
- There is a need to create a level playing field among both financial and non-financial organizations.
- Agents and agent networks—the customer interface for digital financial services—introduce new risks including fraud, agent error, poor cash management by the agent and poor data handling.
- The quality and reliability of the ICT infrastructure and system affect the risks of disrupted service and lost data, and risk of privacy or security breach.
- In the event the consumer suffers a loss, liability can be unclear due to the multiple providers involved in service delivery.

Fintech has the potential to accelerate financial inclusion, and to do so, regulators and policymakers play key roles in enabling innovation and putting in place essential safeguards. It will also be necessary to improve financial and digital literacy.

## 4.11 HEALTH INFORMATICS

**KEYWORDS** health informatics, digital health, e-health, telehealth, telemedicine

Health informatics is the use of ICT-based innovations in healthcare services delivery, management and planning. Health informatics has the potential to expand healthcare coverage to rural and remote areas, improve service quality, enhance affordability and optimize resources.

For instance, telemedicine can provide healthcare in rural and remote areas, and at the same time, absorb many patients with minor routine complaints, taking pressure off traditional healthcare facilities. Smart applications such as integrated patient flow management systems can improve the utilization of hospitals and specialized equipment without compromising on availability for patients. IoT networks can improve treatment compliance, and big data analytics and AI can advance disease prevention, diagnosis and treatment. 5G networks can expand access to quality healthcare and enable remote surgery. Remote surgery involves the transmission of 3D video data of the surgical site, and medical data related to the patient, in real time. The remote surgeon can also control a surgery robot based on received data, while delivering control information to perform surgical actions. Moreover, smart applications can engage users in maintaining their own wellness and preventive care, as well as play a role in shifting healthcare systems from treating illness to preventing it.

Some common challenges in the uptake of health informatics include the sensitivity of health data, the lack of interoperability of systems and data, and the lack of capacity and cooperation mechanism in the design, roll out and upscaling of health informatics applications.

Healthcare decisions deal with very sensitive information, require timely information and action, and sometimes have life or death consequences. The importance and complexity of these decisions create a hesitancy in adopting digital tools. The sensitive nature of healthcare decisions and data also creates major concerns about privacy and data security. Patients are concerned about their data being used in ways that may damage their reputation or insurance rating, and the healthcare industry has been resistant to make information available as open data for fear of violating privacy. Standards and guidelines are needed for the anonymization and sharing of health data that protects privacy and ensures accountability and responsible use of data.

## 4.12 CYBER RESILIENCE

**KEYWORDS** **cyber resilience, cyber risk management, cybersecurity, e-resilience, critical infostructure, data breaches**

Connectivity increases the risks posed by cyberthreats and the magnitude of these threats rises as networks become more connected. Moreover, cyberattacks are becoming increasingly sophisticated with the advancement of technology. There is, in fact, an upward trend in the intensity, frequency and severity of cyberattacks on the digital and physical infrastructure.

With mobile technology, cloud computing and IoT creating new openings for cyber threats, the risks are greater than ever. Additionally, AI is increasing the sophistication of cyberattacks, thus putting individuals, organizations and governments without access to up-to-date security measures at high risk.

A robust cyber resilience framework is therefore crucial for ensuring the safety and security of individuals and organizations, as well as for creating an enabling environment for innovations in fintech, health informatics, intelligent transport, smart cities and other fields. Cyber resilience can be defined as the ability of systems and organizations to develop and execute long-term strategy to withstand cyber events.

Cross-border collaboration between the public and private sectors, in the form of sharing threat information and best practices, is critical to combating cybercrime and building cyber resilience. Through policies and regulations, it will be vital to promote good security practices among service providers, manufacturers and developers, and expand and strengthen the cadre of cybersecurity experts.

To build cyber resilience, organizations need to have sufficient investment in cybersecurity and plan in building a strategy to streamline cybersecurity operations and compliance. Most importantly, organizations should ensure that their approach is holistic, not just by looking at its technology and processes, but also the people involved—most often the weakest link in the chain. Educating and building a security culture amongst employees is probably the best defense against cyberattacks.

Nations have made use of intelligent technologies such as AI, big data, cloud computing and IoT to boost cyber resilience, such as the use of sensors to monitor critical service networks, and the use of AI to detect and prevent cyberattacks.

## 4.13 FUTURE SKILLS

**KEYWORDS** future skills, 21st century skills, digital skills, digital literacy, reskilling, upskilling

In the fourth industrial revolution, intelligent technologies are giving rise to new categories of jobs, while partially or wholly displacing others, at a faster pace than ever before. Jobs are being displaced by increased automation and new positions for which current education and training systems are not yet fully equipped to provide. The skills required in both old and new occupations will probably change in most industries and transform the way people work. Identifying and building these future skills will be one of the most challenging aspects in leveraging the opportunities of the fourth industrial revolution.

Governments and businesses need to play an active role in reskilling and upskilling the workforce so that they are equipped with future skills. These include complex problem solving, critical thinking, creativity, innovation, entrepreneurship, leadership, negotiation, and working collaboratively across sectors and borders, as well as skills in leveraging the technologies of AI, big data, blockchain, cloud computing and IoT.<sup>10</sup>

This will require significant investments, as well as a change of mindset that recognizes human capital investment as an asset rather than a liability, and a commitment to lifelong learning. At the same time, a reorienting of education and training curricula and methods is necessary to produce a future-ready workforce. This may include developing programs aimed specifically at women and girls who are often underrepresented in the ICT sector.

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10 World Economic Forum, *The Future of Jobs Report 2018* (Geneva, 2018).

Policymakers, regulators and educators will need to play a fundamental role in helping those who are displaced repurpose their skills or acquire new skills. It is also vital to develop inclusive strategies and tap the skills of the non-traditional workforce, including people with disabilities and special needs, out-of-school youth and the retired.

## 4.14 CAPACITY BUILDING

**KEYWORDS** capacity building, digital citizenship, digital literacy, lifelong learning, research and development

Capacity building for the fourth industrial revolution includes promoting digital citizenship (i.e., the norms of appropriate, responsible technology use),<sup>11</sup> standing up for one's privacy rights, raising cybersecurity awareness, developing education and lifelong learning initiatives, and promoting interdisciplinary research and development on the application of intelligent technologies for sustainable social and economic development.

It also involves unlocking the potential of a large young population by promoting and supporting entrepreneurship and startups through better access to markets, finance and skills, and developing local innovation ecosystems, including innovation networks and collaborative environments (e.g., innovation labs) that promote cross-sector and cross-country innovation partnerships.

To nurture talent for the future, there is a need to demolish typical boundaries of learning, by making learning easily available and flexible, both online and offline. Being able to fit work and caring responsibilities around study is especially helpful for those who are unable to be present on campus every day.

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<sup>11</sup> Digital Citizenship, <http://www.digitalcitizenship.net/>.

There are over 2,000 Tech4Ed centers throughout the nation, and its learning platform can be leveraged to develop the ICT capacity of Filipinos, particularly reskilling and upskilling for the fourth industrial revolution, and strengthening individuals and organizations' cyber resilience.

A multi-stakeholder partnership of governments, industry employers, education providers and others are required to experiment and invest in new types of education and training provision to fully benefit from the fourth industrial revolution and to harness the intelligent technologies for sustainable development.

More fundamentally, the fourth industrial revolution is challenging our ideas of the world and is bringing to light in very obvious ways the widening inequality and the exploitation of people's vulnerabilities. This forces us to reassess our shared human values, which in turn shape our strategies and operations in government, business and civil society. Our future will depend on how well we succeed to collectively define our priorities, engage in questions about values and ethics, and align technological development accordingly. We have to consciously build positive values into the technologies we create, think about how they are to be used, and design them with ethical application in mind – in support of collaborative, sustainable and inclusive ways of preserving what is important to us. Platforms for multi-stakeholder dialogue and participatory models that include citizens and social groups will be vital.





# STRATEGIC THRUSTS

In terms of digital inclusion, equal access to opportunity is of paramount significance in bridging the countryside and narrowing the digital divide. In view of this, ICT development must be continuously pushed across different regions and cultures. To achieve this, strategic thrusts must be in place to ensure that the integrated digital economy is not hindered by various constraints.

Indeed, the growing relevance of ICT cannot anymore be underestimated, and for this reason, NICTEF identifies the following six (6) areas mirroring the digital transformation strategies of the government for sustainable development of the ICT ecosystem. NICTEF shall focus on promoting these thrusts in order to achieve its vision. Each thrust is supported by ongoing and proposed ICT-related projects of the DICT and its attached agencies which are expected to steer the country closer to the realization of the thrust's goals. This chapter also provides a snapshot of how the framework elements are addressed by the key projects identified. The key projects have been analyzed by their respective focal to determine the degree of their impact to the framework elements.

## 5.1 PARTICIPATORY E-GOVERNANCE

With the increasing reliance on the internet for delivery of government services and day-to-day citizens' transactions and business operations (e.g. G2C, G2G, C2C, C2B, etc.), the Philippine populace' strong market potential poses challenges pertinent to setting up an ecosystem of interconnected and interoperable electronic communications system that is responsive to the needs of a digital society.

Generally, good economics is equated with good governance as one of the main ingredients in achieving growth. At the onset of the digital age, when there is proliferation of new technologies in all aspects of our daily activities, the demand for the government to deliver services in an environment that is open, transparent and efficient is definitely at its peak.

With the application of ICTs in enhancing the government's role in service delivery, public administration, and promotion of participatory democracy, digital transformation has paved the way for social progress to happen. With this, the NICTEF shall focus on providing leadership, direction and coordination in the development, implementation and use of ICT for socio-economic development and for delivery of public service to digitally-empowered citizens in the digital economy.

At the onset, seamless data exchange ensures smoother government transactional services, ease of doing business and a confident citizenry. Viewing the lens of governance as a public good, the public domain reflects trust as a basic tenet both of civil service and of the internet, especially on upholding the citizen's charter.

This thrust on participatory e-governance seeks to deepen citizen participation in the governmental processes by examining the assumptions and practices of the traditional view that generally hinders the realization of a genuine participatory democracy. The thrust also addresses the inter-related questions of citizen competence, empowerment, and capacity building, and evaluates the impact of participatory governance on service delivery, social equity, and political representation.

**TABLE 5.1. KEY PROJECTS ON PARTICIPATORY E-GOVERNANCE AND THEIR IMPACT ON THE FRAMEWORK ELEMENTS**

| STRATEGIC THRUST           | PROJECTS                                                 | FRAMEWORK ELEMENTS |                              |                    |                               |                                     |
|----------------------------|----------------------------------------------------------|--------------------|------------------------------|--------------------|-------------------------------|-------------------------------------|
|                            |                                                          | Human Capital      | Affordable Access and Device | Platforms          | Infrastructure/ Infostructure | Standards, Regulations and Policies |
| Participatory e-Governance | National Government Portal                               | (2)                | (1)                          | (3)                | (2)                           | (2)                                 |
|                            | E-Government Masterplan 2022                             | (2)                | (2)                          | (2)                | (1)                           | (3)                                 |
|                            | Integrated Business Permits and Licensing System (iBPLS) | (2)                | (1)                          | (3)                | (2)                           | (2)                                 |
| <b>LEGEND</b>              |                                                          | Strong Impact (3)  | Some Impact (2)              | Limited Impact (1) |                               |                                     |

## 5.2 INDUSTRY AND COUNTRYSIDE DEVELOPMENT

The dynamism of change mirrors the tapestry of national and regional development. At the onset of open governance, the social fabric is enriched by the allied fields of mobile telecommunications, digital broadcasting and information technology. This ecosystem of interactions magnifies the growth potential of the ICT industry, strategic in propelling the country as an economic gravitas in ASEAN as a thriving landscape to invest in and an exciting interconnectivity hub.

Notable programs have been initiated inasmuch as ease of setting up and doing business is concerned, particularly in the fields of e-commerce starting from the law institutionalizing the use of electronic means for undertaking commercial processes back in 2000. Also included in these efforts are the provisioning of financial services and deployment of digital payment platforms to areas without access previously, in cooperation with private telecommunications companies.

By making broadband services available and affordable for all, it has become vital for economic growth and social welfare. Thus, it is in setting up conducive environments such as innovation hubs that the complex interplay of the underpinning science, technology adoption, idea commercialization and business incubation fosters growth in the micro, small and medium enterprises (MSMEs). Alongside the fiscal support and incentives from government and banking institutions, ICT then plays as the enabling tool anchored on the network infrastructure, the applications that run on it, and the services that govern its operation.

With NICTEF, the nation will achieve a knowledge-based economy wherein the state recognizes the vital role of scientists and engineers in developing solutions in reference to national priorities, through permissionless innovation. This opportunity brings about the MSMEs capability to transact with individuals, businesses, and entities through integrated financing facilities, and eventually offer products and services with relatively new business and profitability models, oftentimes, disruptive and fostering rapid innovation.

This thrust also takes into consideration the quantity, quality and scalability of talent, availability of infrastructure, competitive cost of doing business, government support and the state of business environment in sustaining the benefits and addressing the challenges of the digital economy. By bringing ICT to the countryside, it will aid in achieving an inclusive economic growth in the country.

**TABLE 5.2. KEY PROJECTS ON INDUSTRY AND COUNTRYSIDE DEVELOPMENT AND THEIR IMPACT ON THE FRAMEWORK ELEMENTS**

| STRATEGIC THRUST                     | PROJECTS                                                                             | FRAMEWORK ELEMENTS |                              |           |                               |                                     |
|--------------------------------------|--------------------------------------------------------------------------------------|--------------------|------------------------------|-----------|-------------------------------|-------------------------------------|
|                                      |                                                                                      | Human Capital      | Affordable Access and Device | Platforms | Infrastructure/ Infostructure | Standards, Regulations and Policies |
| Industry and Countryside Development | digitalcitiesPH                                                                      | (2)                | (1)                          | (2)       | (3)                           | (2)                                 |
|                                      | Digital Terrestrial Television Broadcasting: Comprehensive Nationwide Implementation | (1)                | (3)                          | (2)       | (2)                           | (2)                                 |

|               |               |     |             |     |                |     |
|---------------|---------------|-----|-------------|-----|----------------|-----|
| <b>LEGEND</b> | Strong Impact | (3) | Some Impact | (2) | Limited Impact | (1) |
|---------------|---------------|-----|-------------|-----|----------------|-----|

**TABLE 5.2. (CONT'D) KEY PROJECTS ON INDUSTRY AND COUNTRYSIDE DEV'T AND THEIR IMPACT ON THE FRAMEWORK ELEMENTS**

| STRATEGIC THRUST                     | PROJECTS                    | FRAMEWORK ELEMENTS |                              |                    |                               |                                     |
|--------------------------------------|-----------------------------|--------------------|------------------------------|--------------------|-------------------------------|-------------------------------------|
|                                      |                             | Human Capital      | Affordable Access and Device | Platforms          | Infrastructure/ Infostructure | Standards, Regulations and Policies |
| Industry and Countryside Development | Rural Impact Sourcing       | (3)                | (1)                          | (2)                | (2)                           | (2)                                 |
|                                      | seedPH                      | (3)                | (2)                          | (2)                | (2)                           | (2)                                 |
|                                      | Stepping Up the Value Chain | (3)                | (1)                          | (2)                | (2)                           | (2)                                 |
|                                      | Tech4ED                     | (2)                | (2)                          | (3)                | (1)                           | (1)                                 |
|                                      | Spectrum Roadmap            | (2)                | (2)                          | (2)                | (3)                           | (2)                                 |
| <b>LEGEND</b>                        |                             | Strong Impact (3)  | Some Impact (2)              | Limited Impact (1) |                               |                                     |

## 5.3 RESOURCE SHARING AND CAPACITY BUILDING THROUGH ICT

The pace at which ICT evolves is strikingly fast, and as citizens grow in anticipation for the realization of enhanced public service delivery, it has become more apparent that the contract with the Filipino people is foremost in the achievement of the nation's goal, AmBisyon Natin 2040, of prosperity for all. Digital transformation then will pave the way for social progress to happen.

It is precisely due to consumers' dependence on the interconnection and interoperability of information technology, broadcasting and telecommunications, that the trends of today necessitate the nation to implement projects that would push forward the ICT agenda for inclusive growth and sustainable development.

As business now are highly dependent on ICT, it is incentivizing to ensure that the industry gets services at competitive rates, in a timely manner and maintained with an acceptable level of service.

To complement this growth, the productive workforce of the future should be equipped with skills related to telecommuting. The ultimate objective would be putting a huge number of digital laborers home-based or in pockets of co-working spaces/satellite portable offices, so as to augment the economic losses brought about by traffic issues plaguing the central business districts, and therefore adding value to the quality of life for digital workers.

This thrust also brings in focus the essentials to the development and protection of integrated government ICT infrastructures and design architecture, taking into consideration the inventory of existing workforce, plans, programs, software, hardware, and installed systems, while advocating for continuing professional development by means of digital tools and enabling traditional ones with ICT and enhancing the ICT-related education curriculum.

**TABLE 5.3. KEY PROJECTS ON RESOURCE SHARING AND CAPACITY BUILDING THROUGH ICT AND THEIR IMPACT ON THE FRAMEWORK ELEMENTS**

| STRATEGIC THRUST                                   | PROJECTS                                                 | FRAMEWORK ELEMENTS |                              |           |                               |                                     |
|----------------------------------------------------|----------------------------------------------------------|--------------------|------------------------------|-----------|-------------------------------|-------------------------------------|
|                                                    |                                                          | Human Capital      | Affordable Access and Device | Platforms | Infrastructure/ Infostructure | Standards, Regulations and Policies |
| Resource Sharing and Capacity Building Through ICT | Digital Literacy Training Project                        | (3)                | (2)                          | (2)       | (2)                           | (2)                                 |
|                                                    | Government-wide Medium-term ICT Harmonization Initiative | (2)                | (1)                          | (1)       | (1)                           | (3)                                 |

|               |               |     |             |     |                |     |
|---------------|---------------|-----|-------------|-----|----------------|-----|
| <b>LEGEND</b> | Strong Impact | (3) | Some Impact | (2) | Limited Impact | (1) |
|---------------|---------------|-----|-------------|-----|----------------|-----|

## 5.4 IMPROVED PUBLIC LINKS AND CONNECTIVITY

The Philippines has been developing progressively in light of a robust infostructure build-out across its major island groups - Luzon, Visayas and Mindanao. At its core, the government recognizes the opportunities and challenges of emerging technologies that cultivate integrated economies, blur geographic boundaries and empower future talents.

Further, access to information is vital in building a knowledge-based economy wherein civil society, businesses and the government work together in an environment that incentivizes efficient delivery of information be it in the form of real-time news updates, fundamental

stock prices, or disaster warning advisories. Priority is then given to the last mile dimension as advances in technology allow for ICT-enabled media that has more extensive reach, higher capacity to connect and faster data rates.

Increased infusion of investments in the telecommunications industry is poised to drive countryside development for a more accessible, inclusive and affordable digital economy. An example of which includes the government submarine cable landing station wherein its operation will not only provide enterprise class connectivity for government agencies to deliver online citizen services, but also significantly lower the bandwidth cost for nationwide connectivity. More importantly, it can provide years of expandability for future government ICT programs in health, education and transparency.

In a few years, the Philippines will have to maximize the potential of a young, digitally-enabled workforce by laying the groundwork today for improved public links coupled with effective policy frameworks that are forward responsive, technology neutral and underpinned on convergence and open access. Operationalizing advancements in mobile cellular technology as well as fixed wireline solutions using fiber and emergent technologies necessitates audit and assessment of infrastructure, mapping network coverage, and inventory of available bandwidth in terms of capacity, redundancy, traffic routing and data integrity.

Reflecting on a previous ITU study, which said: "The higher penetration of broadband, the more important is its contribution to economic growth," which also makes for "a positive contribution of broadband to job creation in developed and developing countries", this thrust covers discussion on leveraging connectivity to streamline business processes, reduce costs and improve operational efficiencies and enterprises drive innovation to move the focus from a consumer driven internet to an industrial one.

Said build-outs include the establishment of data centers and layout of fiber optic networks to interconnect government offices and provide high-speed communication and sharing of tasks and data. Inventory of software includes online tools, services and applications for use by government agencies and citizens that enables the delivery of social services, even to the grassroots of society.

**TABLE 5.4. KEY PROJECTS ON IMPROVED PUBLIC LINKS AND CONNECTIVITY AND THEIR IMPACT ON THE FRAMEWORK ELEMENTS**

| STRATEGIC THRUST                       | PROJECTS                                            | FRAMEWORK ELEMENTS |                              |           |                               |                                     |
|----------------------------------------|-----------------------------------------------------|--------------------|------------------------------|-----------|-------------------------------|-------------------------------------|
|                                        |                                                     | Human Capital      | Affordable Access and Device | Platforms | Infrastructure/ Infostructure | Standards, Regulations and Policies |
| Improved Public Links and Connectivity | Free Wi-Fi Internet Access in Public Places Project | (1)                | (2)                          | (2)       | (3)                           | (1)                                 |
|                                        | Government Network                                  | (1)                | (2)                          | (2)       | (3)                           | (1)                                 |
|                                        | National Broadband Program                          | (1)                | (1)                          | (2)       | (3)                           | (2)                                 |
|                                        | National Government Data Center (NGDC) Project      | (1)                | (2)                          | (2)       | (3)                           | (1)                                 |
|                                        | Philippine Roadmap for 5G Technology                | (1)                | (2)                          | (2)       | (2)                           | (3)                                 |
| LEGEND                                 | Strong Impact                                       | (3)                | Some Impact                  | (2)       | Limited Impact                | (1)                                 |

## 5.5 ICT USER PROTECTION AND INFORMATION SECURITY

Filipinos depend on the internet for a multitude of things like students accessing open learning courseware, professionals utilizing e-application of licenses, and businesses doing online banking transactions. Having identified critical infostructures in the banking, transportation, and energy industries to name a few, their resiliency and overall integrity is premised on a complex interplay of policy, technology and developmental aspects tied together in a distinct, cohesive and responsive manner, be it in law enforcement, national defense or network protection.

Cybersecurity poses real threats, thus emphasis must be given on creating an enabling environment where laws are relevant and able to address disruptive issues in relation to cyber threats; such cases need arbitration of highly trained professionals that transcends the physical and the cyber arena.

On the other hand, information security simply implies the protection and preservation of information, with its central purpose to protect and preserve the confidentiality, integrity, and availability of information. It may also involve protecting and preserving the authenticity and reliability of information and ensuring that entities exhibit accountability.

This thrust, in summary, considers several issues including end user computing security, information classification, file management, back-up, handling of sensitive or confidential data, responsible use of the internet including email, data protection legislation, disaster planning and system continuity. Further, this shall provide a strategic direction of making the Philippines cyber resilient and the ways to achieve such vision through knowledge management as a community of practice.

After all, businesses, citizens and the government rely on the internet as the backbone of operations. This encompasses ensuring that the entities, systems, and processes involved can exchange ICT information in a safe and secure ICT environment.

**TABLE 5.5. KEY PROJECTS ON ICT USER PROTECTION AND INFORMATION SECURITY AND THEIR IMPACT ON THE FRAMEWORK ELEMENTS**

| STRATEGIC THRUST                             | PROJECTS                                                   | FRAMEWORK ELEMENTS |                              |           |                               |                                     |
|----------------------------------------------|------------------------------------------------------------|--------------------|------------------------------|-----------|-------------------------------|-------------------------------------|
|                                              |                                                            | Human Capital      | Affordable Access and Device | Platforms | Infrastructure/ Infostructure | Standards, Regulations and Policies |
| ICT User Protection and Information Security | Data Privacy Breach and Security Incident Reporting System | (3)                | (1)                          | (2)       | (1)                           | (1)                                 |
|                                              | National CyberSecurity Plan 2022                           | (2)                | (2)                          | (2)       | (3)                           | (2)                                 |
|                                              | Cybersecurity Management System                            | (2)                | (1)                          | (3)       | (2)                           | (2)                                 |
| LEGEND                                       | Strong Impact                                              | (3)                | Some Impact                  | (2)       | Limited Impact                | (1)                                 |

## 5.6 *ENABLING AND SUSTAINABLE ICT ENVIRONMENT*

Although mainstream environmental protection deals with land use management, marine conservation and geoscience research, a localized perspective on the role of a sustainable ICT environment is necessary in disaster risk reduction and management. Indeed, disaster management through ICT is an administrative priority which ensures that economic growth is sustained and vulnerabilities are minimized.

Drawing from the collective experience of the Philippines, being situated in the Pacific Ring of Fire and the Typhoon Belt, the archipelago is exposed to geographical vulnerabilities such as earthquakes, tsunamis and volcanic activities. As disaster management steadily gains traction over the recent years, ICT also finds its way towards streamlining processes as an enabling tool for the realization of effective information exchange.

Major ICT application areas include monitoring and data acquisition systems for disaster prevention and mitigation, weather forecasting systems for disaster preparedness, intelligent operations center, and emergency communication systems for disaster response, and information systems for tracking donations and funds for making disaster recovery efforts more transparent.

Undoubtedly, the rise of ICT strengthens environmental resilience and disaster preparedness on a national level. This thrust explores how the Internet and the ICT and related research communities can help tackle environmental challenges in the country through more environmentally sustainable models of economic development, and examines the status of current and emerging environmentally friendly technologies, equipment and applications in supporting programs aimed at addressing climate change and improving energy efficiency,

including digital divide between gender groups and ensure that the benefits of ICT are evenly accessible to all.

This trend puts forth advances in ICT as a dynamic platform that extends government capabilities like establishing disaster operations centers, all-weather communication systems, and predictive warning platforms.

Also, this thrust covers gender gaps. These exist in many forms including iterations of the digital divide, wherein ICT when viewed from both macro- and microeconomic perspectives, creates an imbalance in society that leaves a portion of the community either unconnected, uneducated or uninformed. This may pertain to lack of knowledge of how certain technology works, of the opportunities that abound its use, and of the livelihood created by new requirements of the digital workforce.

Further, the increased occurrence of certain genders being marginalized in cyberspace has also been alarming. While qualified access to information promises a brighter future through more informed decision-making, aided by trends like Artificial Intelligence, Big Data and Machine Learning, it is imperative that the government in consultation with various stakeholders promulgate policies and issuances that will facilitate the use of ICT most notably by those who are marginalized.

**TABLE 5.6. KEY PROJECTS ON ENABLING AND SUSTAINABLE ICT ENVIRONMENT AND THEIR IMPACT ON THE FRAMEWORK ELEMENTS**

| STRATEGIC THRUST                         | PROJECTS                                                          | FRAMEWORK ELEMENTS |                              |           |                               |                                     |
|------------------------------------------|-------------------------------------------------------------------|--------------------|------------------------------|-----------|-------------------------------|-------------------------------------|
|                                          |                                                                   | Human Capital      | Affordable Access and Device | Platforms | Infrastructure/ Infostructure | Standards, Regulations and Policies |
| Enabling and Sustainable ICT Environment | Alternative Dispute Resolution System for Data Privacy Complaints | (1)                | (1)                          | (2)       | (1)                           | (3)                                 |
|                                          | Women's ICT Development Index                                     | (2)                | (2)                          | (2)       | (1)                           | (3)                                 |
| LEGEND                                   | Strong Impact                                                     | (3)                | Some Impact                  | (2)       | Limited Impact                | (1)                                 |

Please refer to Annex A for a brief description of the key projects. A complete list of the projects will be made available in the NICTEF website. The website will also contain more information on each project which include:

- Project Title
- Contact Details
- Website, if any
- Lead Proponent(s)
- Supporting Partner(s)
- Beneficiaries
- Framework Elements
- Strategic Enablers
- Strategic Thrusts
- To-date Accomplishments
- Expected Outcomes
- Timeframe
- Budget (Actual/Forecast)





# STRATEGIC INDICATORS

In order to measure the progress of the ecosystem, the following indicators were selected. Certainly, there are project-level and even sector-level indicators that would show progress on a more granular level. These measures are often included at the project level. For example, the "National Broadband Program" and the "Free Wi-Fi Internet Access in Public Places" each have their own success indicators which will be monitored and evaluated.

However, at the ecosystem level, there is a need to select indicators that would conflate multiple measures, since it takes an ecosystem working in concert, and not any individual project or program, to move the needle on these indicators.

**TABLE 6.1. ECOSYSTEM-LEVEL INDICATORS**

| NAME OF INDICATOR                     | ORGANIZING BODY                        |
|---------------------------------------|----------------------------------------|
| Network Readiness Index               | World Economic Forum                   |
| ICT Development Index                 | International Telecommunications Union |
| Digital Adoption Index                | World Bank                             |
| Freedom on the Net Index              | Freedom House                          |
| World Digital Competitiveness Ranking | IMD World Competitiveness Center       |
| Affordability Drivers Index           | Alliance for Affordable Internet       |
| Inclusive Internet Index              | Economist Intelligence Unit            |
| E-Government Development Index        | United Nations                         |

On the following pages, we have included a description of each indicator, as well as a short write-up on the methodology and criteria used in computing the indicator. We also include the score for the Philippines, as compared to a subset of ASEAN countries.

## 6.1 NETWORK READINESS INDEX (WORLD ECONOMIC FORUM)

**SUMMARY** The Network Readiness Index is published by the World Economic Forum since 2001 together with INSEAD & Cornell.<sup>12</sup> The primary goal of the index is to benchmark the exercise of technology readiness for 140+ countries to guide different governments in leveraging ICT to drive economic progress.

<sup>12</sup> <https://www.itu.int/en/ITU-D/Regional-Presence/ArabStates/Documents/events/2016/ICTind/Presentations/Session6/Session%20c%20-%20Baller%20-%20TRA%20ITU%20Forum%20Dubai%20NRI%2020161214.pdf>

**CRITERIA** The Global Information Technology Report, from where the Network Readiness Index is primarily used, identifies 10 crucial pillars of measurement.

Ranging from measuring functional government institutions to the presence of digital infrastructure and business incentives, the pillars identify areas of success and improvements for each country towards achieving universal access of ICT. The following show a brief explanation of the contents of each pillar<sup>13</sup>:

**TABLE 6.2. PILLARS OF NETWORKED READINESS INDEX**

| ENVIRONMENT SUB-INDEX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>1st Pillar: Political and regulatory environment</b> – Primarily refers to the laws surrounding ICT, including the regulatory framework and the enforcement of rules in contracts, intellectual property, etc.</p> <p><b>2nd Pillar: Business and innovation environment</b> – Looks at different indicators of a healthy business environment: government processes, education, and the investments in technology. It also includes indices for taxes, venture capital, and the availability of latest technology.</p> |
| READINESS SUB-INDEX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>3rd Pillar: Infrastructure</b> – Indices relating to the building of necessary digital highways</p> <p><b>4th Pillar: Affordability</b> – Indices directly related to the cost of access</p> <p><b>5th Pillar: Skills</b> – Refers to the necessary knowledge to create, use, and improve network technologies</p>                                                                                                                                                                                                      |

<sup>13</sup> [http://www3.weforum.org/docs/GITR2016/GITR\\_2016\\_full%20report\\_final.pdf](http://www3.weforum.org/docs/GITR2016/GITR_2016_full%20report_final.pdf)

**TABLE 6.2. (CONT'D) PILLARS OF NETWORKED READINESS INDEX**

| USAGE SUB-INDEX                     |                                                                                                                                                         |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6th Pillar: Individual usage</b> | – Documents network users in different categories (i.e. social groups, type of technologies, functions)                                                 |
| <b>7th Pillar: Business usage</b>   | – Documents various industry practices that take advantage of network technologies and the commercial viability of certain innovations                  |
| <b>8th Pillar: Government usage</b> | – Measures government participation in ICT                                                                                                              |
| IMPACT SUB-INDEX                    |                                                                                                                                                         |
| <b>9th Pillar: Economic impacts</b> | – Measures ICT's impact using economic indices and other proxies for improvement                                                                        |
| <b>10th Pillar: Social impacts</b>  | – Broadly measures adaptation of network technologies in key institutions (governments, schools, etc.) in the provision of basic and universal services |

Each pillar represents many variables, all measured from 1 (as the lowest) to 7 (as the highest). The Index aggregates data from 53 different indicators, arranged using the Network Readiness framework. A country is essentially assigned a higher score the more it “possesses the drivers necessary for digital technologies to unleash their potential, and on whether these technologies are actually impacting the economy and society”<sup>14</sup>.

<sup>14</sup> [http://www3.weforum.org/docs/GITR2016/GITR\\_2016\\_full%20report\\_final.pdf](http://www3.weforum.org/docs/GITR2016/GITR_2016_full%20report_final.pdf)

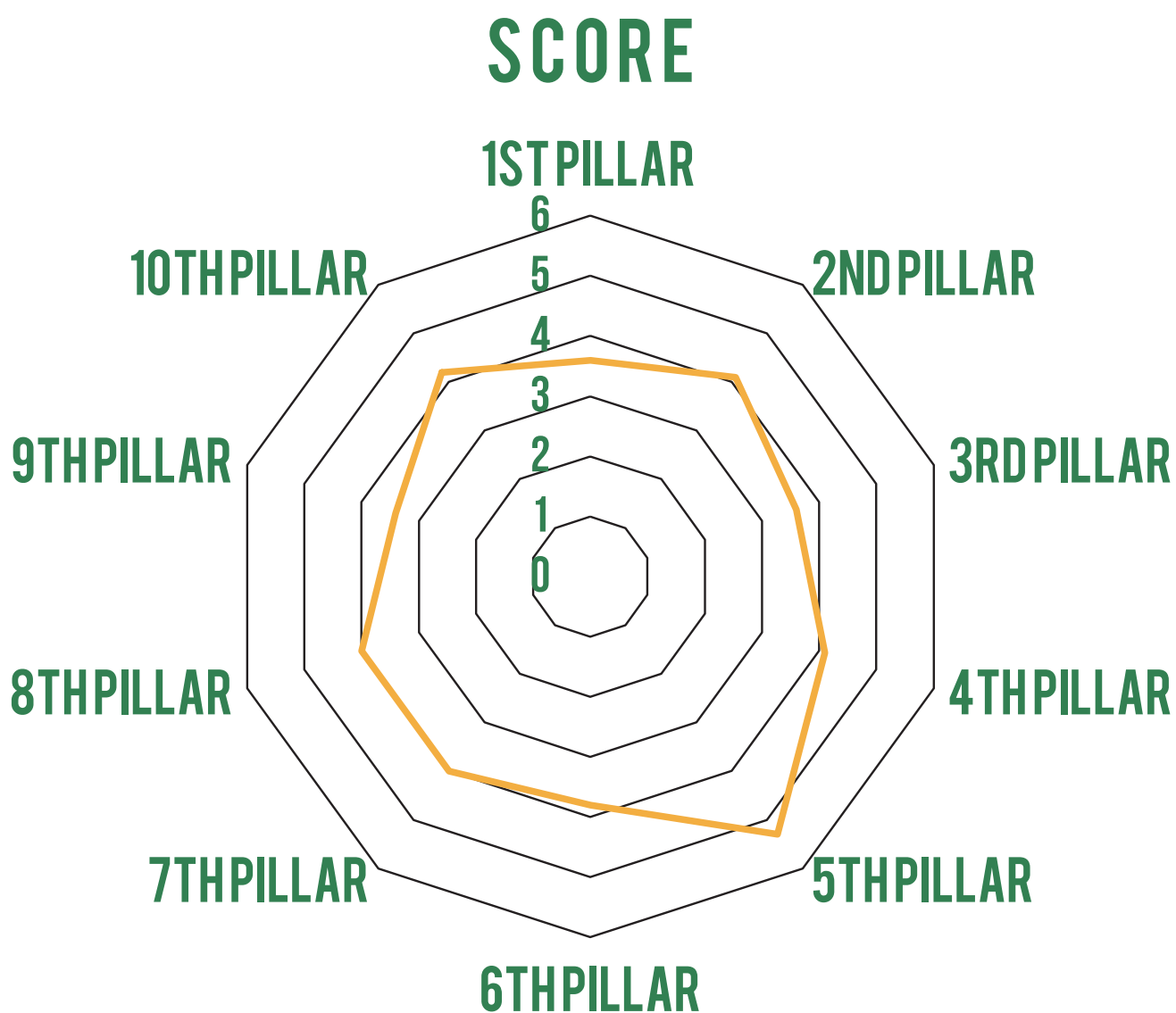
**TABLE 6.3. ASEAN COUNTRIES' NETWORK  
READINESS RANKING AND RATING, 2016<sup>15</sup>**

| RANK      | COUNTRY            | RATING     |
|-----------|--------------------|------------|
| 1         | Singapore          | 6.0        |
| 31        | Malaysia           | 4.2        |
| 62        | Thailand           | 4.2        |
| 73        | Indonesia          | 4.0        |
| <b>77</b> | <b>Philippines</b> | <b>4.0</b> |
| 79        | Vietnam            | 3.0        |
| 104       | Lao (PDR)          | 3.4        |
| 109       | Cambodia           | 3.4        |
| 133       | Myanmar            | 2.7        |
| —         | Brunei             | —          |

The Philippines recorded a score of 4.0 out 7.0 and by far has an increasing trend of score since 2012. The country has ranked 77th out of the 139 economies included in the survey. Figure 3 displays the overview performance of the Philippines according to categories or pillars of the abovementioned sub-indices. It can be noticed in the graph that the Philippines has scored the highest in the 5th Pillar, Skills, which is under the Readiness sub-index. This implies that the country has a fairly higher enrollment rate in secondary education, better quality of education system, and higher adult literacy rate through an efficient use of ICT. Meanwhile, the Philippines has ranked high, 36th, in the 7th Pillar which is Business Usage. This means that it is one of the countries that utilize ICT in a wide extent of their business operation and has a huge capacity to come up with new innovations. Despite a score of 4.1 in the 4th Pillar, Affordability, the country has only ranked 107th among all the economies, indicating that the country has a relatively higher retail price of mobile telephony and broadband internet subscription due to limited competition in the market.

<sup>15</sup> <http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/>

**FIGURE 3. PERFORMANCE OVERVIEW OF THE PHILIPPINES IN THE NRI<sup>16</sup>**



<sup>16</sup>

World Economic Forum. (2016). The Global Information Technology Report 2016. Retrieved from <http://reports.weforum.org/global-information-technology-report-2016/economies/#economy=PHL>.

## 6.2 ICT DEVELOPMENT INDEX (INTERNATIONAL TELECOMMUNICATIONS UNION)

**SUMMARY** Used in the Measuring the Information Society Report (MISR), the ICT Development Index (IDI) is an ICT data and benchmarking tool to measure the information society,<sup>17</sup> that is, measure the changes taking place in countries at different levels of ICT development.<sup>18</sup>

**CRITERIA** The Index makes use of three general categories, according to its conceptual framework: (1) Access sub-index, (2) Use sub-index, and (3) Skills sub-index.<sup>19</sup>

———— **ICT infrastructure and access indicators** – This sub-index captures ICT readiness, and includes five infrastructure and indicators.

———— **ICT usage indicators** – This sub-index captures ICT intensity, and includes three intensity and usage indicators.

———— **ICT skills indicators** – This sub-index seeks to capture capabilities or skills which are important for ICTs, and includes three proxy indicators.

Each of the 11 indicators correspond to a percentage and weight in the final computation of the rankings. Access and usage get a weight of 40 while skills are assigned a weight of 20.

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17 <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017.aspx>

18 <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017/methodology.aspx>

19 <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017/methodology.aspx>

**TABLE 6.4. ASEAN COUNTRIES' IDI RANKING AND RATING, 2017<sup>20</sup>**

| RANK       | COUNTRY            | RATING      |
|------------|--------------------|-------------|
| 18         | Singapore          | 8.05        |
| 53         | Brunei             | 6.75        |
| 63         | Malaysia           | 6.38        |
| 78         | Thailand           | 5.67        |
| <b>101</b> | <b>Philippines</b> | <b>4.67</b> |
| 108        | Vietnam            | 4.43        |
| 111        | Indonesia          | 4.33        |
| 128        | Cambodia           | 3.28        |
| 135        | Myanmar            | 3.00        |
| 139        | Lao (PDR)          | 2.91        |

As seen in Table 6.5, the average IDI value for 2017 among the 176 countries was 5.11 with the Iceland having the highest IDI of 8.98 and Eritrea with the lowest IDI of 0.96. Meanwhile, the Philippines scored 4.87 within the possible range of 0 to 10.

The world average IDI Access Sub-Index is 5.59 in which the Philippines scored 4.87. Among the indicators of this sub index, some of the indicators with significant differences are the fixed-telephone subscription per 100 inhabitants wherein the world average is 13.57 with the Philippines only having 3.71 indicating such a small number of Filipinos with fixed telephone subscriptions as they opt to use mobile phones, evident in the 109.17 score in the mobile-cellular telephone subscription per 100 inhabitants.

20 <https://www.itu.int/net4/ITU-D/idi/2017/index.html>

Another indicator in which the Philippines scored much lower compared to the world average is that of the international internet bandwidth per Internet user, as the country had a record of 43439.79 bits per second and a world average of 74464 bits per second. The percentage of households with computer in the Philippines is only 39.10%, relatively smaller than the world average of 46.61%.

In terms of the IDI Use Sub-Index, the Philippines scored 3.70 while the world average has reached 4.26. The percentage of individuals using the internet in the country is 55.50% which is almost 10% higher than that of the world average. Meanwhile, in the other remaining indicators, fixed (wired)-broadband subscription and active mobile-subscription per 100 inhabitants, the Philippines has scored 5.46 and 46.38, respectively. These are noticeably lower than the world average.

With the IDI Skills Sub-Index, the Philippines scored a 6.20, higher than the world average of 5.85. In its indicators, mean years of schooling and secondary gross enrolment ratio, the Philippines scored 6.20 and 9.30 which are higher than the world average. Meanwhile, it scored 35.75 in the tertiary gross enrolment ratio, more than 3 points lower than the world average.

**TABLE 6.5. COMPARISON BETWEEN THE WORLD  
IDI 2017 VALUE AND THE PHILIPPINES<sup>21</sup>**

| IDI INDICATORS                                             | WORLD       | PHILIPPINES |
|------------------------------------------------------------|-------------|-------------|
| <b>IDI 2017 Value</b>                                      | <b>5.11</b> | <b>4.67</b> |
| <b>IDI Access Sub-Index</b>                                | <b>5.59</b> | <b>4.87</b> |
| Fixed-telephone subscription per 100 inhabitants           | 13.57       | 3.71        |
| Mobile-cellular telephone subscription per 100 inhabitants | 101.53      | 109.17      |
| International internet bandwidth per internet user (Bit/s) | 74464       | 43439.79    |
| Percentage of households with computer                     | 46.61       | 34.04       |
| Percentage of households with Internet access              | 51.46       | 39.10       |
| <b>IDI Use Sub-Index</b>                                   | <b>4.26</b> | <b>3.70</b> |
| Percentage of individuals using the Internet               | 45.91       | 55.50       |
| Fixed (wired)-broadband subscription per 100 inhabitants   | 12.39       | 5.46        |
| Active mobile-broadband subscriptions per 100 inhabitants  | 52.23       | 46.28       |
| <b>IDI Skills Sub-Index</b>                                | <b>5.85</b> | <b>6.20</b> |
| Mean years of schooling                                    | 8.52        | 9.30        |
| Secondary gross enrolment ratio                            | 84.00       | 88.39       |
| Tertiary gross enrolment ratio                             | 38.69       | 35.75       |

21 <http://www.itu.int/net4/ITU-D/idi/2017/index.html?#idi2017comparison-tab>

## 6.3 DIGITAL ADOPTION INDEX (WORLD BANK)<sup>22</sup>

**SUMMARY** The Digital Adoption Index is a global index that measures countries' digital adoption across three dimensions of the economy: people, government, and business. The index covers 180 countries on a 0–1 scale and emphasizes the “supply side” of digital adoption to maximize coverage and simplify theoretical linkages. The overall index is the simple average of three sub-indices. Each sub-index comprises technologies necessary for the respective agent to promote development in the digital era:

- increasing productivity and accelerating broad-based growth for business,
- expanding opportunities and improving welfare for people, and
- increasing the efficiency and accountability of service delivery for government.

Although data and theoretical constraints prohibit any index from providing a comprehensive view of an economy, the Digital Adoption Index (DAI) provides a useful framing mechanism for digital adoption across economic agents and countries. By measuring the relative adoption of digital technologies, the index can assist policy makers in designing a digital strategy with tailored policies to promote digital adoption across different user groups.

The DAI is intended to reflect actual adoption of digital technologies across the economy, not perceptions of adoption. Accordingly, indicators comprising the index represent subscriptions, access, or adoption and eschew public or elite opinion surveys. Most data come from the International Telecommunication Union or the World Bank. Other sources include Eurostat, GSMA, and Netcraft. Data were collected for two time periods: 2014 and 2016.

<sup>22</sup> <https://openknowledge.worldbank.org/bitstream/handle/10986/30437/9781464813252.pdf>

**CRITERIA** The business sub-index measures the quality of digital infrastructure needed for e-commerce and other business functions, comprising the number of secure servers and international internet bandwidth, as well as the percentage of businesses with websites as a proxy for their more general online business activities.

The people sub-index measures the extent and quality of individuals' connections to the digital world, comprising access to mobile-cellular phones, basic internet, and mobile and fixed broadband.

And the government sub-index measures the adoption of core administrative systems to automate and streamline government activities and digital identification systems and online public services that allow the government to better serve the public.

Missing values are estimated, and indicators normalized to create a complete and balanced data set. A few indicators— particularly the percentage of businesses with websites—are missing observations for many countries. Instead of dropping the countries, missing values are imputed using data on per capita income, internet use, and geographical region. Data are normalized on a 0–1 scale so that each indicator has equal weight within a sub-index. In all but one case, indicators are normalized across both years, not within each individual year. Observed changes can therefore be considered absolute changes in value for particular countries, not merely a reordering based on relative trajectories between countries.

For example, the DAI score for the Philippines increased from 0.44 to 0.49 over the period 2014–16. This means that the Philippines made progress over the period, increasing digital adoption. If scores were normalized within years (not across years), it would not be possible to determine if an increase in the Philippines' score meant the Philippines made progress, or other countries regressed.

Normalized data is averaged so that the DAI's constituent indicators have equal weight at each level. For example, the government indicator of core administrative systems is composed of four categorical variables collected by the World Bank. After the scores are normalized, the simple average is calculated. The resulting average represents the country's score for core administrative systems. The core administrative systems score is then averaged with the scores for digital identification and online public services, which are generated using a similar process. And the resulting average at that level represents the government sub-index score.

The business and people sub-indices follow the same process. The overall DAI varies on a 0–1 scale because its source indicators are normalized to that scale. As with the sub-indices, 0 is the lowest possible score on the DAI, representing no adoption of digital technologies, and 1 is the highest possible score, representing full adoption of digital technologies. Theoretically, a country can score a perfect 1 if it has the best score on all the indicators comprising the DAI or a perfect 0 if it has the worst score on all the indicators. But in practice, DAI scores ranged 0.14–0.87 in 2014 and 0.15–0.87 in 2016.

In 2016, the Philippines earned a score of 0.43 in the DAI which is relatively lower than the average score of its neighboring countries within East Asia and Pacific which is 0.50. The country scored 0.35 in the Business sub-indicator, lowest among the three sub-indices. In the said indicator, it was found that the Philippines had 92% 3G coverage, download speed of 3349 kbps, and 11 million secure servers. In terms of People sub-index, the country scored 0.52 which is lower than the average score of 0.63 of countries in East Asia and Pacific. The study shows that only 18% of the Filipinos have internet access at home while 88% have mobile access at home. In the Government sub-index, the Philippines earned a score of 0.43 which is equal to the average score of its neighboring countries. The country scored 0.48 in online public services, 0.03 in digital identification, and 0.77 in core administrative systems.

**TABLE 6.6. ASEAN COUNTRIES'  
DIGITAL ADOPTION INDEX**

| COUNTRY            | INDEX – 2014 | INDEX – 2016 |
|--------------------|--------------|--------------|
| Singapore          | 0.87         | 0.87         |
| Malaysia           | 0.65         | 0.69         |
| Brunei             | 0.57         | 0.63         |
| Thailand           | 0.57         | 0.62         |
| Vietnam            | 0.47         | 0.54         |
| <b>Philippines</b> | <b>0.44</b>  | <b>0.49</b>  |
| Indonesia          | 0.39         | 0.46         |
| Cambodia           | 0.36         | 0.40         |
| Lao (PDR)          | 0.20         | 0.26         |
| Myanmar            | 0.17         | 0.26         |

## 6.4 FREEDOM ON THE NET INDEX (FREEDOM HOUSE)

**SUMMARY** The Freedom on the Net Index, part of Freedom House’s annual Freedom on the Net report, scores 65 countries across the globe on “each country’s level of internet and digital media freedom based on a set of methodology questions developed in consultation with international experts to capture the vast array of relevant issues that enable internet freedom. The index also measures access and openness of other digital means of transmitting information, particularly mobile phones and text messaging services.”<sup>23</sup>

Aside from measuring technical access to ICT, this index also measures individuals’ freedom to access ICT technologies and services. The quality of access measured by this index therefore covers not just infrastructural and economic barriers to access, but also challenges to individual rights as enabled by ICT.

<sup>23</sup> <https://freedomhouse.org/report/freedom-net-methodology>

This includes the “transmission and exchange of news and other politically relevant communications” and the “protection of users’ rights to privacy and freedom from both legal and extralegal repercussions arising from their online activities.”

**CRITERIA** The index draws heavily from the definition of free expression outlined in Article 19 of the Universal Declaration of Human Rights, which states: “Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive, and impart information and ideas through any media regardless of frontiers.”<sup>24</sup>

It also takes into consideration specific circumstances where freedom of expression and access to information may be legitimately restricted. It accepts restrictions that are “in line with international human rights standards, the rule of law, and the principles of necessity and proportionality.”

The index maintains that policies and procedures that aim to censor or surveil must be “transparent and include avenues for appeal available to those affected.”

There are three general categories for the questions asked in the report, that is eventually scored:

— **Obstacles to Access** details infrastructural and economic barriers to access, legal and ownership control over internet service providers, and independence of regulatory bodies;

— **Limits on Content** analyzes legal regulations on content, technical filtering and blocking of websites, self-censorship, the vibrancy and diversity of online news media, and the use of digital tools for civic mobilization;

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24 <https://freedomhouse.org/report/freedom-net-methodology>

**Violations of User Rights** tackles surveillance, privacy, and repercussions for online speech and activities, such as imprisonment, extralegal harassment, or cyberattacks.

Under each category, each question is scored on a varying range of points. A lower number of points is allotted for a freer situation, while a higher number of points is allotted for a less free environment. A country's total points for all three categories represent its final score, rated from 0 to 100. Based on the score, Freedom House determines whether a country's assigned internet freedom rating is "Free (Scores 0-30)," "Partly Free (Scores 31-60)," or "Not Free (Scores 61-100)."

The Philippines earned a score of 31 making it a "partly free" country. The report has also noted that the Philippines has slipped from a Free to Partly Free country and is one of the countries that had biggest declines in the score. Philippines previously had a score of 28 in 2017. This decline is due to content manipulation and cyber attacks that threatened to distort online information which calls for a stronger cybersecurity for the country.

**TABLE 6.7. ASEAN COUNTRIES' FREEDOM ON THE NET RATING, 2018**

| COUNTRY     | RATING |
|-------------|--------|
| Philippines | 31     |
| Singapore   | 41     |
| Malaysia    | 45     |
| Indonesia   | 46     |
| Cambodia    | 55     |
| Myanmar     | 64     |
| Thailand    | 65     |
| Vietnam     | 76     |
| Brunei      | –      |
| Lao (PDR)   | –      |

## 6.5 WORLD DIGITAL COMPETITIVENESS RANKING (IMD WORLD COMPETITIVENESS CENTER)<sup>25</sup>

**SUMMARY** Introduced in 2017, the World Digital Competitiveness Ranking (WDCR) analyzes the extent to which a country adopts and explores digital technologies and their role in transforming government practices, business models and society.

**CRITERIA** WDCR rankings are calculated using 50 different standings, collated from 30 hard and 20 survey data. After the data has been summarized, countries are then ranked from the most to the least digital competitive. The index investigates three factors (knowledge, technology, and future readiness), with each corresponding to three sub-factors and all of which influence 50 different indicators.

**TABLE 6.8. FACTORS OF THE WORLD DIGITAL COMPETITIVENESS INDEX**

| KNOWLEDGE                                                              | TECHNOLOGY                                                           | FUTURE READINESS                                                |
|------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------|
| Know-how necessary to discover, understand, and build new technologies | Overall context that enables the development of digital technologies | Level of country preparedness to exploit digital transformation |
| Talent<br>Training and Education<br>Scientific Concentration           | Regulatory Framework<br>Capital<br>Technological Framework           | Adaptive Attitudes<br>Business Agility<br>IT Integration        |

Each of the 9 sub-factor has equal weight (i.e., roughly 11.1%). In each of the different criteria measured, hard data—which analyzes digital competitiveness (e.g., Internet bandwidth speed)—represents a weight of 2/3 in the overall ranking, while soft data (or survey data)—which analyze competitiveness (e.g., agility of companies)—represents a weight of 1/3. The results are then aggregated, making the total consolidated data the basis for the overall ranking of the WDCR.

<sup>25</sup> IMD World Competitiveness Center (2018). *IMD World Digital Competitiveness Ranking 2018*. Retrieved from <https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2018/>

The Philippines earned an overall rank of 56, part of the bottom 10 countries, which is 10 steps lower than its previous rank in 2017. It has also been consistently falling in the ranking since 2014. Knowledge factor has improved but was still outweighed by the declines in technology and future readiness factors. Capital sub-factor under technology has had a major drop from 29th to 43rd due to decline in perceptions about the effectiveness of banking and financial services and availability of venture capital. Adaptive attitudes and business agility, under readiness factor, has dropped from 50th to 60th.

**TABLE 6.9. ASEAN COUNTRIES' WDC RANKING FOR OVERALL, KNOWLEDGE, TECHNOLOGY, AND FUTURE READINESS, 2018**

| COUNTRY            | OVERALL   | KNOWLEDGE | TECHNOLOGY | FUTURE READINESS |
|--------------------|-----------|-----------|------------|------------------|
| Singapore          | 2         | 1         | 1          | 15               |
| Malaysia           | 27        | 17        | 22         | 29               |
| Thailand           | 39        | 44        | 28         | 49               |
| <b>Philippines</b> | <b>56</b> | <b>50</b> | <b>58</b>  | <b>52</b>        |
| Indonesia          | 62        | 61        | 59         | 62               |
| Vietnam            | –         | –         | –          | –                |
| Myanmar            | –         | –         | –          | –                |
| Cambodia           | –         | –         | –          | –                |
| Brunei             | –         | –         | –          | –                |
| Lao (PDR)          | –         | –         | –          | –                |

## 6.6 AFFORDABILITY DRIVERS INDEX (ALLIANCE FOR AFFORDABLE INTERNET)<sup>26</sup>

**SUMMARY** The Affordability Drivers Index (ADI) is an assessment of the drivers of internet affordability. The ADI spans 61 countries and zooms in two key aspects influencing affordability: communications infrastructure and access.

The ADI is contained in the Affordability Report, which examines how the policies to accelerate access to affordable Internet have progressed across 61 low- and middle-income countries.

**CRITERIA** The ADI looks at two broad categories of indicators: **infrastructure** and **access**.

The infrastructure sub-index measures the current extent of infrastructure deployment and operations, alongside the policy and regulatory frameworks in place to incentivize and enable cost-effective investment in future infrastructure expansion. Variables included in this sub-index include, for example, the amount of international bandwidth available in a particular country, and an assessment of a nation's spectrum policy.

The access sub-index measures current broadband adoption rates and the policy and regulatory frameworks in place to encourage growth and ensure provision of affordable and equitable access. This sub-index includes variables such as current internet penetration rates and an assessment of the effectiveness of a country's Universal Service and Access Funds.

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<sup>26</sup> <https://a4ai.org/affordability-report/>

The following tables show the different indicators within each category. Each data is classified either as primary data and secondary data. Primary data is collected from a survey constructed by the Alliance for Affordable Internet, Web Foundation, and many other advisers from different countries. The survey includes questions on “issues regarding policy, regulation, and various other aspects around broadband and affordable access to the internet.” Conversely, secondary data refers to data collected from existing providers or institutions.

**TABLE 6.10. ASEAN COUNTRIES' WDC RANKING FOR OVERALL, KNOWLEDGE, TECHNOLOGY, AND FUTURE READINESS, 2018**

| TYPE      | INDICATORS                                                                                                                                                                                  |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary   | Clear, time-bound targets in National Broadband Plan for reducing cost & increasing penetration                                                                                             |
| Primary   | USAFs used to subsidize access for underserved and underprivileged populations                                                                                                              |
| Primary   | ICT regulatory decisions informed by adequate evidence                                                                                                                                      |
| Primary   | Specific policies to promote free or low-cost access                                                                                                                                        |
| Primary   | To what extent have Universal Access/Service Funds (USF) prioritized infrastructure investments that will reduce costs and increase access for underserved communities and market segments? |
| Primary   | To what extent does the gov't ICT regulator perform its functions according to published and transparent rules, with the ICT regulatory decisions influenced by public consultations?       |
| Primary   | To what extent do the country's broadband policies include strategies and programs to improve access and use among women and girls?                                                         |
| Secondary | Market Concentration – Herfindahl Index (HHI)                                                                                                                                               |
| Secondary | Existence of National Broadband Plan                                                                                                                                                        |
| Secondary | Mobile broadband connections (% of all connections)                                                                                                                                         |
| Secondary | Cluster of ITU indicators (bundled)                                                                                                                                                         |
| Secondary | Percentage of individuals using the Internet                                                                                                                                                |
| Secondary | Market penetration – Mobile Internet unique subscribers                                                                                                                                     |
| Secondary | Smartphone – adoption                                                                                                                                                                       |

**TABLE 6.11. AFFORDABILITY DRIVERS INDEX,  
ACCESS SUB-INDEX, DATA SOURCES  
AND DESCRIPTION**

| TYPE      | INDICATORS                                                                                                                            |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------|
| Primary   | Flexible, technology & service neutral ICT licensing frameworks                                                                       |
| Primary   | Specific guidelines for public infrastructure funding & telecoms subsidies                                                            |
| Primary   | Time bound gov't plan to make available broadband spectrum for high-speed data services                                               |
| Primary   | Transparent, competitive and fair process for increasing spectrum availability                                                        |
| Primary   | To what extent does the regulator and/or the competition commission enforce the country's ICT licensing requirements and regulations? |
| Primary   | National policies in place facilitating efficient access to public rights of way & tower zoning permissions                           |
| Primary   | To what extent does the government facilitate resource sharing across telecommunications operators?                                   |
| Secondary | International bandwidth per Internet user (bits/s)                                                                                    |
| Secondary | Investment per telecom subscriber (average over 3 years)                                                                              |
| Secondary | Secure Internet servers (per 1 million people)                                                                                        |
| Secondary | Electrification Rate                                                                                                                  |
| Secondary | Existence of Internet Exchange Points (IXPs)                                                                                          |
| Secondary | Existence of Number portability between mobile network operators                                                                      |
| Secondary | 3G Network coverage, by population                                                                                                    |

The Philippines ranked 31st out of 61 countries. One of the key findings of the report is that island archipelagos such as the Philippines face a particular challenge in providing affordable internet. Industry cost incurred in providing broadband access for an island archipelago nation is five times higher than the cost for coastal nations.

**TABLE 6.12. ASEAN COUNTRIES' ACCESSIBILITY DRIVERS INDEX, 2018**

| RANKING   | COUNTRY            | ACCESS       | INFRASTRUCTURE | ADI       |
|-----------|--------------------|--------------|----------------|-----------|
| 1         | Malaysia           | 95.9         | 60.8           | 82.44     |
| 9         | Thailand           | 77.5         | 50.36          | 67.71     |
| 16        | Indonesia          | 73.42        | 43.88          | 62.12     |
| 25        | Vietnam            | 58.65        | 46.03          | 55.44     |
| 30        | Myanmar            | 48.45        | 52.48          | 53.46     |
| <b>31</b> | <b>Philippines</b> | <b>55.15</b> | <b>43.04</b>   | <b>52</b> |
| 38        | Cambodia           | 52.75        | 39.7           | 48.96     |
| –         | Singapore          | –            | –              | –         |
| –         | Brunei             | –            | –              | –         |
| –         | Lao (PDR)          | –            | –              | –         |

## 6.7 INCLUSIVE INTERNET INDEX [ECONOMIST INTELLIGENCE UNIT]

**SUMMARY** Commissioned by Facebook and conducted by The Economist Intelligence Unit (EIU), the Inclusive Internet Index aims to quantify the extent to which the Internet is “relevant to all, allowing usage that enables positive social and economic outcomes at individual and group level.”<sup>27</sup>

**CRITERIA** The index assesses the performance of 86 countries in four categories of inclusion: Accessibility, Affordability, Relevance and Readiness. Its primary objective is to construct a framework for the current state of internet inclusion around the world, and to help policymakers and important stakeholders “gain a clearer understanding of the factors that contribute to wider and sustainable inclusion.”<sup>28</sup>

<sup>27</sup> <https://theinclusiveinternet.eiu.com/about>

<sup>28</sup> <https://theinclusiveinternet.eiu.com/assets/external/downloads/3i-bridging-digital-divides.pdf>

The index looks at four broad categories:<sup>29</sup>

— **Availability:** Refers to the quality and breadth of available infrastructure required for access. The category looks at use of the Internet, the quality of the Internet connection, and the type and quality of infrastructure available for Internet access and electricity access in both urban and rural areas of the country.

— **Affordability:** Looks at the cost of access to the Internet and considers initiatives, whether private or public, to decrease costs or promote access in other ways. Cost of access relative to income is a critical factor in Internet adoption. The category includes factors that look at price, such as the cost of a handset or fixed-line broadband, and the competitive environment for wireless and broadband operators.

— **Relevance:** Describes the value of being connected, in terms of useful services and content and the availability of local content. The category measures the availability of local content, such as whether basic information or government services are available online in the local language. It also measures whether content and services that stimulate economic activity, such as those relating to health, finance, commerce or entertainment, are available online. The category includes measures of the value of the Internet to consumers.

— **Readiness:** A measure of the capacity among Internet users to take advantage of being online. The category looks at measures such as the level of literacy and educational attainment, the level of web accessibility, privacy regulations, the level of trust in different sources of information found online, national female e-inclusion policies and spectrum policy.

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29 <https://theinclusiveinternet.eiu.com/assets/external/downloads/3i-methodology.pdf>

Each category receives a score, calculated from a weighted average of the underlying indicator scores, and scores are scaled from 0 to 100, where 100 indicates the strongest environment for the adoption and productive use of the Internet. Each category also has a weight assigned to it:

**TABLE 6.13. INCLUSIVE INTERNET INDEX  
CATEGORY WEIGHTS**

| CATEGORY      | WEIGHTS |
|---------------|---------|
| Availability  | 40%     |
| Affordability | 30%     |
| Relevance     | 20%     |
| Readiness     | 10%     |
| TOTAL         | 100%    |

The Philippines had an overall rating of 65.7 placing to the 54th rank. The study has also concluded that the country had an average gender gap of 14.3% in favor of women and is on top of the index in the said matrix. Other top performers are mostly high-income countries such as France, UK, and South Korea.

**TABLE 6.14. ASEAN COUNTRIES'  
INCLUSIVE INTERNET INDEX  
OVERALL RANKINGS, 2018<sup>30</sup>**

| OVERALL RANKING | COUNTRY            | OVERALL RATING |
|-----------------|--------------------|----------------|
| 2               | Singapore          | 89.1           |
| 28              | Malaysia           | 78.7           |
| 31              | Thailand           | 77.8           |
| 43              | Vietnam            | 72.4           |
| 49              | Indonesia          | 68.0           |
| <b>54</b>       | <b>Philippines</b> | <b>65.7</b>    |
| 65              | Myanmar            | 57.2           |
| 72              | Cambodia           | 53.3           |
| –               | Brunei             | –              |
| –               | Lao (PDR)          | –              |

30 <https://theinclusiveinternet.eiu.com/explore/countries/performance>

## 6.8 E-GOVERNMENT DEVELOPMENT INDEX (UNITED NATIONS)<sup>31</sup>

**SUMMARY** The E-Government Development Index (EGDI) assesses e-government development at the national level. Its primary objective is to measure the readiness and capacity of national institutions to use ICTs to deliver public services.

The EDGI is a tool of analysis under the United Nations E-Government Survey, which aids in the implementation of Sustainable Development Goals (SDGs) by providing new analysis and evidence to utilize the potential of e-government. It also examines how governments can leverage on information technologies to build sustainable and resilient societies.

**CRITERIA** EDGI is a composite index based on the weighted average of three normalized indices: (1) Telecommunications Infrastructure Index (TII) based on data provided by the International Telecommunications Union (ITU), (2) Human Capital Index (HCI) based on data provided by the United Nations Educational, Scientific and Cultural Organization (UNESCO), and (3) the Online Service Index (OSI) based on data collected from an independent survey questionnaire, conducted by UNDESA, which assesses the national online presence of all 193 United Nations Member States.

The Philippines has slipped from 71st rank in 2016 to 75th in 2018. Despite this, the country is few lower middle-income countries which earned a score higher than the global EGDI average of 0.55.

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<sup>31</sup> [https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2018-Survey/E-Government%20Survey%202018\\_FINAL%20for%20web.pdf](https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2018-Survey/E-Government%20Survey%202018_FINAL%20for%20web.pdf)

**TABLE 6.15. ASEAN COUNTRIES' E-GOVERNMENT DEVELOPMENT INDEX, RANKINGS AND RATINGS, 2018<sup>32</sup>**

| RANKING   | COUNTRY            | RATING        |
|-----------|--------------------|---------------|
| 7         | Singapore          | 0.8812        |
| 48        | Malaysia           | 0.7174        |
| 59        | Brunei             | 0.6923        |
| 73        | Thailand           | 0.6543        |
| <b>75</b> | <b>Philippines</b> | <b>0.6512</b> |
| 88        | Vietnam            | 0.5931        |
| 107       | Indonesia          | 0.5258        |
| 145       | Cambodia           | 0.3753        |
| 157       | Myanmar            | 0.3328        |
| 162       | Lao (PDR)          | 0.3056        |

<sup>32</sup> <https://publicadministration.un.org/egovkb/en-us/data-center>



# MOVING FORWARD

In order to ensure that the NICTEF retains its relevance and remains attuned to both evolving developmental requirements as well as dynamic innovation in ICTs, the DICT with its stakeholder partners shall maintain and engage in processes that allow for ongoing inputs to and periodic reviews of and revisions to the framework.

In order to foster multistakeholder participation and operationalize the NICTEF as a living document, the DICT will pursue the following activities.

## 7.1 *PERIODICAL UPDATE PROCESS*

Beginning June 2019, and every June thereafter, the NICTEF will be open to updates, coursed through the CIO Council and the Sectoral and Industry Task Forces. Sub-committees will be created at the Regional level to aid in this process to more effectively respond and cater to the needs of the countryside.

Updates will be posted on the NICTEF Website. The objective is to ensure that the national ICT agenda continues to be relevant and responsive to the values, vision, and mission of the ICT Ecosystem.

## 7.2 WEBSITE

A NICTEF website will be established to serve a platform for the stakeholders to communicate with the DICT and to contain information and updates on the framework which may include the following:

- Descriptions of the individual project profiles;
- Working papers, photo gallery and results of focus group discussions, consultations, and other data gathering activities used and conducted in creating the NICTEF;
- Forums and interactive polls will be posted on a regular basis to gather insights and comments on matters relevant to the implementation of the NICTEF and encourage a more participatory and inclusive approach of decision-making;
- Blog posts from members of the CIO Council and Sectoral/Industry Task Force;
- Updates on the strategic Indicators to provide the stakeholders an idea as to what areas of the ICT ecosystem need improvement;
- Copies of Memorandum of Understanding or Memorandum of Agreement with other national government agencies, local government units, civil society organizations, among others; and
- Administrative Orders, Memorandum Circulars, etc.

The website's URL will be [www.ictecosystem.org.ph](http://www.ictecosystem.org.ph) with the official hashtag #nictef. The website is set to be launched during the first quarter of 2019.

## 7.3 ADVOCACY CAMPAIGNS

In order to disseminate information and to promote the goals and strategies of the NICTEF to a wider audience, the DICT together with its partners will be conducting various advocacy campaigns.

Publication of the NICTEF, including brochures and teasers, shall be distributed to libraries and local government executives.

Information dissemination using mass media such as posting of articles in newsprint, creating posters, radio and television guestings or appearances.

Audio visual presentations containing information on the objectives and strategies of the NICTEF to be posted on social media. These presentations shall also be made in various dialects to accommodate more audiences especially in areas outside of Metro Manila.

Feedback and discussion groups will also be made available on social media designed to collect opinions on the ongoing and future activities for the implementation of NICTEF.

Regional Consultations will also be conducted for coordination and updating of the ICT projects being undertaken by the locality and to also serve as a medium for the regional stakeholders to propose projects to be undertaken which will further promote the strategies of the NICTEF.

Annual NICTEF Conference, where project proponents will be given a venue to present their updates to stakeholders, will also be conducted. The conference will also be a venue for other stakeholders to express their suggestions and queries on the projects to be presented. This will also be an opportunity for the stakeholders to identify possible areas for partnerships and collaborations.

Commitment Sessions will also be organized where stakeholders can formalize their commitment to NICTEF participation through various resolutions or memorandum of agreements, as appropriate. These sessions will help ensure that roles of the stakeholders are clearly laid out and functions are appropriately distributed.

## 7.4 KEY AUDIENCES FOR ADVOCACY CAMPAIGNS

The DICT will target to invite the following audiences during the conduct of the abovementioned advocacy campaigns:

Current and potential partners from the private sector and civil society, including academe, research institutions, development agencies, and international funding and technical organizations;

Professional associations, chambers of commerce, and industry or trade groups;

Marginalized groups to be able to gather first-hand information on how NICTEF would be more responsive of the needs of the underserved groups;

Press or media to cover events of the NICTEF and publish reports and articles for better dissemination of public information;

Local government units and regional committees, who are more well informed of the situation of the locals, shall also be invited during regional consultations;

Other national agencies to ensure that the goals and endeavors of the NICTEF and the vision and mission of other sectors and aligned and are in harmony; and

Congress and other regional or local legislatures to better relay and discuss the policies, regulations and standards to be drafted for the implementation of NICTEF.





DEPARTMENT OF  
INFORMATION AND  
COMMUNICATIONS  
TECHNOLOGY

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## APPENDIX A

# PROJECT PROFILES

(as of February 2019)

| PROJECT                                                  | STATUS   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PARTICIPATORY E-GOVERNANCE</b>                        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| National Government Portal                               | Ongoing  | The National Government Portal (NGP) is a single window containing all online information and operational infrastructures, and public services of the government. Citizens can log in to the portal and access government services through online filling of forms and payment. The NGP was established to facilitate a more open and transparent government, promote the efficient delivery of public services; and improve collaboration and partnership among government services. |
| E-Government Masterplan 2022                             | Proposed | The EGMP 2022 serves as the blueprint for a harmonized government information system. The plan outlines DICT's intent of developing the country's e-Government systems through the digital transformation of basic services such as public health, basic education, and other programs that cut across the whole of government. It aims to create a networked and collaborative environment for improved public service delivery.                                                     |
| Integrated Business Permits and Licensing System (iBPLS) | Proposed | From the Electronic Business Permit and Licensing System (eBPLS) which aims to computerize business permits and licensing system through its cloud-based eBPLS software, the Integrated Business Permits and Licensing System (iBPLS) Project envisions to streamline the processing not only of business permits but also including the processing of building permits, certificate of occupancy and barangay clearances.                                                            |
| <b>INDUSTRY AND COUNTRYSIDE DEVELOPMENT</b>              |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| digitalcitiesPH                                          | Ongoing  | The digitalcitiesPH aims to establish ICT hubs outside of the metro and create job and investment opportunities thereby promoting countryside development. This also intends to expand further expand the IT - BPM Industry of the country by developing more host locations especially the untapped locations which are good possible options beyond the more established hubs like Metro Manila, Metro Cebu, Metro Clark and Bacolod City.                                          |

## A-2 NATIONAL ICT ECOSYSTEM FRAMEWORK

| PROJECT                                                                              | STATUS  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INDUSTRY AND COUNTRYSIDE DEVELOPMENT (CONT'D)                                        |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Digital Terrestrial Television Broadcasting: Comprehensive Nationwide Implementation | Ongoing | This is a comprehensive document which details policy and legal framework, and provides technical guidance for concerned stakeholders, measures for fiscal considerations as necessary, and communications strategies for public awareness for the smooth implementation. The migration process aims that broadcasting services currently delivered through the analog network will be fully replicated and provisioned for the digital network, through the Integrated Services Digital Broadcasting-Terrestrial (ISDB-T) standard.                      |
| Rural Impact Sourcing                                                                | Ongoing | The program aims to promote and develop the on-line freelancing industry / home-based outsourcing through advocacy workshops and technical trainings in the rural areas. This is intended to create meaningful ICT-enabled jobs in socio-economically disadvantaged areas in the country.                                                                                                                                                                                                                                                                 |
| seedPH                                                                               | Ongoing | The seedPH Program aims to develop the Philippine Startup Ecosystem and spread the economic potential of digital entrepreneurship in the countryside. It works with local startup communities in advocating and providing interventions that encourage the formation of digital startups and build the capacity of Filipinos to become successful innovators and digital entrepreneurs.                                                                                                                                                                   |
| Stepping Up the Value Chain                                                          | Ongoing | Stepping-Up the Value Chain Program is a long-term strategy that strengthens the country's global positioning in targeted high-growth segments of the IT-BPM industry, including healthcare information management outsourcing; finance, accounting and insurance outsourcing; HR outsourcing; Multilingual BPO; IT Outsourcing; Creative Process Outsourcing; Engineering Outsourcing. Its major target is to conduct industry capacity/ capability building through the provision of industry trainings, seminars, workshops and Rural Impact Sourcing. |
| Tech4ED                                                                              | Ongoing | The Technology for Education, Employment, Entrepreneurs, and Economic Development (Tech4ED) Project promotes digital inclusion by establishing eCenters as access points for ICT-enabled services to various communities. The project addresses the issue on bridging the digital divide in the country by bringing ICT facilities to the unserved and underserved areas.                                                                                                                                                                                 |

| PROJECT                                                   | STATUS   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>INDUSTRY AND COUNTRYSIDE DEVELOPMENT (CONT'D)</b>      |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Spectrum Roadmap                                          | Proposed | The Project is a development of a strategic plan to assess the spectrum economics related to improving broadband access and economic benefits of spectrum in the entire country, including the identification of appropriate methodologies in setting up a spectrum monitoring system or framework. The institution and use of an SRM is a high-level document that helps articulate the strategies and reasons in addressing the spectrum-driven requirements of the evolving ICT ecosystem and the digital economy.                                                                                                                                                                                                                                                                                                |
| <b>RESOURCE SHARING AND CAPACITY BUILDING THROUGH ICT</b> |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Digital Literacy Training Project                         | Ongoing  | The Digital Literacy Training Project seeks to promote digital literacy for the special needs sector such as out-of-school of youth, senior citizen, and persons with disability through the conduct of trainings. The project also aspires to increase ICT Literacy in the Special needs sector so that they would be able to cope up with the current trends and livelihood.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Government-wide Medium-term ICT Harmonization Initiative  | Ongoing  | The Medium-Term Information and Communications Technology Harmonization Initiative (MITHI) is an e-Government and ICT support initiative that aims to harmonize ICT-related resources, programs and projects in all agencies and on all levels of the bureaucracy. The project aims to: (i) To ensure a systematic process for the planning, budgeting, implementation, monitoring, and evaluation of government-wide ICT projects; (ii) To ensure the coherence of ICT programs and projects of the Government and its consistency with the five (5) Key Result Areas (KRA) of the Administration as laid out in EO no. 43 and the Philippine Development Plan 2011-2016; and (iii) To promote synergy among government agencies in planning and implementation of on-going and upcoming ICT programs and projects. |
| <b>IMPROVED PUBLIC LINKS AND CONNECTIVITY</b>             |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Free Wi-Fi Internet Access in Public Places Project       | Ongoing  | The Free Wi-Fi Internet Access in Public Places Project aims to provide free broadband Internet access to cities and municipalities nationwide. Through the project, free public Wi-Fi will be made available in public plazas and parks; public libraries, schools, colleges and universities; rural health units and government hospitals; train stations, airports, and seaports; and national and local government offices                                                                                                                                                                                                                                                                                                                                                                                       |

## A-4 NATIONAL ICT ECOSYSTEM FRAMEWORK

| PROJECT                                                | STATUS  | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IMPROVED PUBLIC LINKS AND CONNECTIVITY (CONT'D)</b> |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Free Wi-Fi Internet Access in Public Places Project    | Ongoing | The Free Wi-Fi Internet Access in Public Places Project aims to provide free broadband Internet access to cities and municipalities nationwide. Through the project, free public Wi-Fi will be made available in public plazas and parks; public libraries, schools, colleges and universities; rural health units and government hospitals; train stations, airports, and seaports; and national and local government offices                                                                                                                                                                                                                                                                                                                                                              |
| Government Network                                     | Ongoing | The Government Network (GovNet) develops fiber optic cables to connect government agencies to a data center which acts as the medium of communication, traffic controller, server and applications host, and keeper and manager of data. GovNet specifically desires to: (i) establish a redundant fiber backbone to directly connect major agencies to a single government network; (ii) connect this agencies to a common data center where government agencies can share resources for common services; (iii) set up sectoral government registries which will be housed in the common data center; and (iv) establish a common data center will act as the medium of communications, traffic controller, server and application host, and keeper and manager of common government data. |
| National Broadband Program                             | Ongoing | The National Broadband Program (NBP) is the seeks to accelerate the deployment of fiber optic cables and wireless technologies to improve the Internet speed in the country. The NBP may enhance ICT-related services by establishing better broadband access.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| National Government Data Center (NGDC) Project         | Ongoing | The National Government Data Center (NGDC) is a launching point of government services like cloud computing, web hosting, server colocation, and other operations. The NGDC will enable faster data exchange and collaboration among government agencies as it provides centralized servers and colocation and storage facilities. The centers are operating 24/7 and are fully equipped with network equipment and connectivity, data storage facilities, cooling, security, power, monitoring, and fire-protection systems                                                                                                                                                                                                                                                                |

| PROJECT                                                    | STATUS   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IMPROVED PUBLIC LINKS AND CONNECTIVITY (CONT'D)</b>     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Philippine Roadmap for 5G Technology                       | Proposed | The Philippine Roadmap for 5G Technologies and Beyond is one of the initiatives of the government that is poised to lay down the groundwork for the development, planning and implementation of 5G and Beyond-based technologies. This roadmap also intends to provide specific strategies that will ready the key sectors on the upcoming implementation, development of use cases, setting and adoption of specification and standards for 5G Technologies and Beyond. The technology roadmap also aims the creation of national ecosystem that will support the policy, regulatory, legal, technical, commercial and economic and financial aspects of the aforesaid technologies. |
| <b>ICT USER PROTECTION AND INFORMATION SECURITY</b>        |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Data Privacy Breach and Security Incident Reporting System | Ongoing  | The Data Privacy Breach and Security Incident Reporting System is an initiative of the National Privacy Commission which seeks to establish an accessible, responsive and easy-to-use complaints system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| National CyberSecurity Plan 2022                           | Ongoing  | The National Cybersecurity Plan 2022 addresses the cyber threats and creates innovative measures for a secure and resilient cyberspace for the Philippines. The NCSP 2022 will serve as an institutional framework and foundation where cybersecurity policies and initiatives will be developed, formulated, and prepared. The plan will be of help in combating cyber threats and promoting a safe ICT environment.                                                                                                                                                                                                                                                                 |
| Cybersecurity Management System                            | Proposed | The Cybersecurity Management System is a whole platform of technologies and tools house at the DICT Security Operation Center (SOC). The platform will assist the National Computer Emergency Response Team (NCERT) to accelerate intelligence and facilitate rapid incident response. NCERT focuses on the day-to-day protection of the Critical Infostructure (CII), Government Network (Public and Military), Individuals; and Business and Supply chains.                                                                                                                                                                                                                         |

**A-6**     *NATIONAL ICT ECOSYSTEM FRAMEWORK*

| ENABLING AND SUSTAINABLE ICT ENVIRONMENT                          |          |                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT                                                           | STATUS   | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                              |
| Alternative Dispute Resolution System for Data Privacy Complaints | Proposed | The Alternative Dispute Resolution System for Data Privacy Complaints hopes to establish a processing/ docketing system for the cases filed to the National Privacy Commission. The project seeks to benefit data subjects, personal information controllers and processors.                                                                                                             |
| Women's ICT Development Index                                     | Proposed | The Women's ICT Development Index (WIDI) is part of the government's effort to mainstream ICT gender initiatives of the country, and the need for the country to have its own ICT-related statistics and establish its own ICT-related database in order to identify areas where the gender digital divide reside in order to inform the Philippines' ICT policy and address these gaps. |

## APPENDIX B

### PROJECTS PROPOSED FOR INCLUSION

| PROPOSED PROJECT/<br>PLAN/PROGRAM    | PROJECT PROPONENT/S                                                                       |
|--------------------------------------|-------------------------------------------------------------------------------------------|
| Broadband Benchmarking/Monitoring    | National Telecommunications Commission (NTC)                                              |
| National Digital ID                  | Philippine Statistics Authority (PSA)                                                     |
| SIM Card Registration                | Department of Info/Comms Technology (DICT)                                                |
| ISSP Template Revisions              | DICT                                                                                      |
| CyberSecurity Compliance Program     | DICT                                                                                      |
| CyberSecurity Assessor Certification | DICT                                                                                      |
| Technology Foresight Council         | DICT                                                                                      |
| ICT Common Operating Environment     | DICT                                                                                      |
| ICT Implementation Guide/Standards   | DICT                                                                                      |
| Mandated Infostructure Assessment    | DICT                                                                                      |
| eHealth 2023 Roadmap                 | Department of Health (DOH)                                                                |
| Household Tracking System            | Department of the Interior<br>and Local Government (DILG)                                 |
| Homegrown ICT Devices                | Department of Science and Technology (DOST)<br>and Department of Trade and Industry (DTI) |
| Filipinnovation Roadmap              | DTI and DOST                                                                              |
| Philippine Business Registry         | DTI                                                                                       |
| Regional Geographical Info System    | National Economic Development Authority (NEDA)                                            |
| Intelligent Transport System         | Department of Transportation (DOTr)                                                       |
| Smart Cities Roadmap                 | NEDA, DICT, DOTR, DILG, NTC                                                               |
| National Single Window               | Department of Finance (DOF)                                                               |

## B-2 NATIONAL ICT ECOSYSTEM FRAMEWORK

| PROPOSED PROJECT/<br>PLAN/PROGRAM | PROJECT PROPONENT/S                                                 |
|-----------------------------------|---------------------------------------------------------------------|
| National Spatial Infrastructure   | National Mapping and<br>Resource Information Authority (NAMRIA)     |
| CIO & DPO in every NGA/LGU        | DILG and DICT                                                       |
| e-Citizen Education               | Department of Education (DepEd)                                     |
| TBIs for Agriculture              | DICT and Department of Agriculture (DA)                             |
| TBIs for Tourism                  | DICT and Department of Tourism (DOT)                                |
| National IT Education Master Plan | Commission on Higher Education (CHED) and DepEd                     |
| STEAM Career Advocacy             | CHED, DepEd, DOST                                                   |
| "Phil-Aware" Disaster Recovery    | National Disaster Risk Reduction<br>and Management Council (NDRRMC) |
| TVWS Emergency Comms System       | NDRRMC                                                              |

## APPENDIX C SUBMISSION FORM

| <b>Project Profile of</b>                                                                                                                                                                                                                                                         | <i>Enter Project Title here.</i>                                                                                                                                                                                                             |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|
| <b>Contact Details</b>                                                                                                                                                                                                                                                            | <i>Enter Name and E-mail Address of Person to be Contacted for further details. Please obtain consent from the person for his/her details to be published in the NICTEF. Alternatively, an institutional e-mail address may be provided.</i> |   |   |
| <b>Website (if any)</b>                                                                                                                                                                                                                                                           | <i>Enter URL here.</i>                                                                                                                                                                                                                       |   |   |
| <b>Lead Proponent</b>                                                                                                                                                                                                                                                             | <i>Enter Name of Lead Agency/Organization here.</i>                                                                                                                                                                                          |   |   |
| <b>Partners (if any)</b>                                                                                                                                                                                                                                                          | <i>Enter Name of Any Supporting Partner Agency/Organization here.</i>                                                                                                                                                                        |   |   |
| <b>Beneficiaries</b>                                                                                                                                                                                                                                                              | <i>Describe/Enumerate Project Beneficiaries here.</i>                                                                                                                                                                                        |   |   |
| <b>Framework Elements Addressed</b> (Place a check mark under "3" for the key framework element impacted by this project. Only one element can be assigned a score of "3". A check under "2" or "1" indicates that there is some impact on this element, but to a lesser degree.) |                                                                                                                                                                                                                                              |   |   |
| FRAMEWORK ELEMENTS                                                                                                                                                                                                                                                                | 1                                                                                                                                                                                                                                            | 2 | 3 |
| Human Capital: Talents and Skills                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                              |   |   |
| Accessibility and Affordability of Devices                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                              |   |   |
| Platforms, Apps, Content, and Data                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                              |   |   |
| Infostructure/Infrastructure                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                              |   |   |
| Standards, Regulations and Policies                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                              |   |   |

## C-2 NATIONAL ICT ECOSYSTEM FRAMEWORK

**Strategic Trends/Enablers** (Place a number beside each strategic trend/enabler below which have a major effect on this project; choose at least "1" and at most "5".)

| STRATEGIC TRENDS/ENABLERS    |  |
|------------------------------|--|
| Fourth Industrial Revolution |  |
| Artificial Intelligence      |  |
| Big Data                     |  |
| Cloud Computing              |  |
| Internet of Things           |  |
| Blockchain                   |  |
| 5G Networks                  |  |
| Smart Cities                 |  |
| Intelligent Transport        |  |
| Fintech                      |  |
| Health Informatics           |  |
| Cyber Resilience             |  |
| Future Skills                |  |
| Capacity Building            |  |

**Framework Elements Addressed** (Place a check mark under "3" for the key framework element impacted by this project. Only one element can be assigned a score of "3". A check under "2" or "1" indicates that there is some impact on this element, but to a lesser degree.)

| FRAMEWORK ELEMENTS                                 | 1 | 2 | 3 |
|----------------------------------------------------|---|---|---|
| Participatory e-Governance                         |   |   |   |
| Industry and Countryside Development               |   |   |   |
| Resource Sharing and Capacity Building Through ICT |   |   |   |
| Improved Public Links and Connectivity             |   |   |   |
| ICT User Protection and Information Security       |   |   |   |
| Enabling and Sustainable ICT Environment           |   |   |   |

|                                 |                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>Accomplishments</b>          | <i>Describe <b>Accomplishments To-Date</b>.</i>                                                                                      |
| <b>Expected Outcomes</b>        | <i>Describe the <b>Outcomes</b> which are expected.</i>                                                                              |
| <b>Timeframe</b>                | <i><b>Start Date</b> and <b>End Date</b> of the project</i>                                                                          |
| <b>Budget (Actual/Forecast)</b> | <i>On an annual basis, give the <b>Annual Spend</b>: actual expenditures (for past years) and projected spend (forward looking).</i> |



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## APPENDIX D MULTISTAKEHOLDER ACTIVITIES

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### D.1 PRELIMINARY ACTIVITIES

#### *PARTNERSHIP WITH ISOC*

In the drafting of the National ICT Ecosystem Framework (NICTEF) and subsequent work on other DICT projects and programs, DICT sought to adopt more inclusive and participatory processes. To this end, DICT signed a Memorandum of Understanding with the Asia Pacific Bureau of the Internet Society (ISOC APAC) on July 05, 2018 at the Office of the Secretary. The ceremony was graced by ISOC Asia Pacific Bureau Regional Director Rajnesh Singh, other representatives of ISOC APAC and ISOC Philippines Chapter, DICT Acting Secretary Eliseo M. Rio Jr. and the department's team leading the development of NICTEF. The Internet Society (ISOC) having extensive experience in global multistakeholder processes shall assist DICT in fostering cooperation, collaboration, and coordination in policy making. Together DICT and ISOC shall promote the multistakeholder governance approach in the development and implementation of key ICT plans, projects and programs. Thus DICT has requested ISOC's participation in the crafting of the NICTEF as well as in conducting Focused Group Discussions and Multistakeholder consultations.

## **D-2**     *NATIONAL ICT ECOSYSTEM FRAMEWORK*

### *FOOTPRINTING IN CEBU CITY, DECEMBER 14, 2017*

Total of 37 participant

72.22% of which were male, remaining 27.78% are female

72.22% from NGAs, 8.33% from LGU, 8.33% from academe, 11.12% from the private sector

The Footprinting was conducted for all the stakeholders in order to enable the attendees to:

Identify ICT-related issues from their respective perspectives which can be addressed through the development of the NICTEF;

Explain the significance of ICT-related and -enabled initiatives of their respective offices; and

Generate action items in order to address the indicated ICT-related issues through the development of the NICTEF.

### *AWARENESS BUILDING IN ICCT COLLEGES, CAINTA, RIZAL, MARCH 24, 2018*

Around 600 participants, attendees were electronics engineering and computer engineering students, and faculty members of ICCT Colleges.

An overview of the NICTEF was presented along with the other plans and programs of the DICT such as Digital Terrestrial Television Broadcasting Migration Plan, E-Government Masterplan 2022, National Broadband Plan, etc.

## ***AWARENESS BUILDING IN UNIVERSITY OF CEBU, BANILAD, CEBU***

- Around 100 participants, attendees were electronics engineering students of University of Cebu
- Presented the overview of NICTEF which includes its commitment to other aspects of the ICT environment, strategic thrust, and key stakeholder groups

### ***PRE-SURVEY***

Prior to the conduct of each Focus Group Discussion (FGD) participants were encouraged to respond to a pre-survey questionnaire which included questions focused on their sectors. The pre-surveys elicited discussion and action points, as well as ICT support needed by their respective sectors and ICT projects being planned or currently undertaken by their organizations. Rough outlines and bullet-points based on the participants' responses then served to initiate and facilitate detailed discussions during the FGDs proper.

## **D.2 FOCUS GROUP DISCUSSIONS (THEMATIC)**

The DICT conducted a series of six (6) Focus Group Discussions, each focusing on the strategic thrusts of the NICTEF. The FGDs were conducted to serve as platforms to: (1) assess needs as encapsulated in the pre-survey; (2) Conceptualize goals to be achieved by the year 2030; (3) formulate projects or initiatives that can be completed by 2022 which will aid in the achievement of the goals; (4) prioritize projects through interactive online voting; and; (5) assess how well the Philippines is currently performing in the areas of the proposed projects.

## D-4 NATIONAL ICT ECOSYSTEM FRAMEWORK

### FGD ON PARTICIPATORY E-GOVERNANCE

Participants:

66.67% are male, 33.33% are female

From the following agencies/organizations: DILG, DICT-PSD, FMA, ISOC PH, DICT- MITHI, NPC, ULAP, CEvans Management Consulting

The strategic thrust on participatory e-governance seeks to deepen citizen participation in governmental processes by examining the assumptions and practices of the traditional view that generally hinders the realization of a genuine participatory democracy. The track also addresses the interrelated questions of citizen competence, empowerment, and capacity building as they relate to participatory governance, and evaluates the impact of participatory governance on service delivery, social equity, and political representation.

Participants identified projects which need to be undertaken in order to achieve the goals of the thrust. The top three projects were: (1) fully-integrated, interoperable, and secure online government system; (2) National digital ID which allows for varying levels of authentication, protects privacy, and prevents identity theft; and (3) Affordable and ubiquitous connectivity.

### FGD ON INDUSTRY AND COUNTRYSIDE DEV'T

Participants:

33.33% are male and 66.67% are female

50% from National Government Agencies, 44.44% from the private sector, and 5.56% from the academe

This thrust takes into consideration quantity, quality and scalability of talent, availability of infrastructure, competitive cost of doing business, government support and business environment in sustaining the benefits and addressing the challenges of the digital economy. Bringing ICTs to the countryside will aid in achieving inclusive economic growth in the country.

Among the projects identified to be undertaken to achieve the goals of the thrust, the top three were: (1) intelligent transportation system; (2) ICT infrastructure; and (3) reforms/amendments in Public Service/ telecom regulations.

### ***FGD ON RESOURCE SHARING AND CAPACITY BUILDING THROUGH ICT***

Participants:

- 63.16% are male and 36.84% are female
- 57.89% from the private sector, 26.32% from NGAs, 15.79% are from the academe

This thrust focuses on the essentials for the development and protection of integrated government ICT infrastructures and designs, taking into consideration the inventory of existing workforce, plans, programs, software, hardware, and installed systems.

Participants identified projects which need to be undertaken in order to achieve the goals of the thrust. The top three projects were: (1) National Broadband Plan; (2) Comprehensive localized standards/ guidelines for ICT implementation; and (3) National IT Education Master Plan.

## **D-6**     *NATIONAL ICT ECOSYSTEM FRAMEWORK*

### *FGD ON IMPROVED PUBLIC LINKS AND CONNECTIVITY*

Participants:

- 61.53% are male and 38.46% are female
- 80.77% from the private sector and 19.23% from NGAs

This thrust covers discussion on leveraging connectivity to streamline business processes, reduce costs and improve efficiency, enterprises will drive innovation and move the focus from a consumer driven Internet to an industrial one.

Participants identified projects which need to be undertaken in order to achieve the goals of the thrust. The top three projects were: (1) National Broadband/ Free WiFi and Implementation; (2) Standard LGU code of telecommunication policies; (3) Augmentation of NTC powers and functions.

### *FGD ON ICT USER PROTECTION AND INFORMATION SECURITY*

Participants:

- 57.14% are male and 42.86% are female
- 47.62% are from the private sector, 38.10% are from NGAs, 14.28% from the academe

Information security central purpose is to protect and preserve the confidentiality, integrity, and availability of information. It may also involve protecting and preserving the authenticity and reliability of information and ensuring that entities can be held accountable.

This track should consider several issues including end user computing security, information classification, file management, back-up, handling of sensitive or confidential data, responsible use of the Internet including email, data protection legislation, disaster planning and system continuity. It includes ensuring that entities, systems, and processes can exchange information in a safe and secure ICT environment.

Participants identified projects which need to be undertaken in order to achieve the goals of the thrust. The top three projects were: (1) Privacy Impact Assessment and Control Measures for National ID; (2) Required Sections in ISSP for Tier 1 Budgeting; and (3) Cybersecurity Compliance Certification Program.

## ***FGD ON ENABLING AND SUSTAINABLE ENVIRONMENT***

Participants:

58.82% are male and 41.18% are female

41.18% are from the private sector, 41.18% are from NGAs, 17.64% are from the academe

This thrust explores how the Internet and the ICT and related research communities can help tackle environmental challenges in the country through more environmentally sustainable models of economic development, and examines the status of current and emerging environmentally-friendly technologies, equipment and applications in supporting programs aimed at addressing climate change and improving energy efficiency, considering also the digital divide between gender groups and ensuring that the benefits of ICT are accessible to all.

## **D-8** *NATIONAL ICT ECOSYSTEM FRAMEWORK*

Participants identified projects which need to be undertaken in order to achieve the goals of the thrust. The top three projects were: (1) Program Management to avoid silo implementation; (2) Technology Foresight Council; (3) Consolidation of data into Phil-Aware.

### **D.3** *REGIONAL MULTISTAKEHOLDER CONSULTATIONS*

NICTEF Multistakeholder Consultations were conducted across Luzon, Visayas, and Mindanao to generate inputs and recommendations for enhancing the framework. During the consultations, presentation of the draft framework was made in three parts. First "What is NICTEF?", followed by a discussion on "What is the Dream of NICTEF?", and finally "How is the Dream Achieved?" Participants were divided into groups according to their related sectors to discuss among themselves and craft their comments and inputs during each breakout session.

#### *REGIONAL MULTISTAKEHOLDER CONSULTATION IN ILOILO CITY*

Participants:

- 98 participants in total
- 61.22% are male and 38.78% are female
- 57.14% from NGAs, 10.20% are LGUs, 7.14% from the academe, and 25.51% from the private sector

## ***REGIONAL MULTISTAKEHOLDER CONSULTATION IN MALOLOS CITY***

Participants:

- 110 participants in total
- 67.27% are male and 32.73% are female
- 24.55% are from NGAs, 25.45% are from LGUs, 40% from the academe, and 10% from the private sector

## ***REGIONAL MULTISTAKEHOLDER CONSULTATION IN CAGAYAN DE ORO CITY***

Participants:

- 105 participants in total
- 50.48% are male and 49.52% are female
- 66.66% are from NGAs, 4.76% are from LGUs, 14.29% are from the academe, 14.29% from the private sector

## **D-10** *NATIONAL ICT ECOSYSTEM FRAMEWORK*

### ***REGIONAL MULTISTAKEHOLDER CONSULTATION IN MANILA***

Participants:

- 54 participants in total
- 53.70% are male and 46.30% are female
- 64.81% are from NGAs, 35.19% are from the private sector

### ***ONLINE PUBLIC SURVEY***

In order to reach a wider audience outside of the consultations and generate more input from diverse groups of stakeholders, the DICT in partnership with ISOC also developed and published an online public survey. The survey consisted of 10 questions mainly focusing on identifying key issues which may be addressed through ICTs. Respondents were given the option to answer the survey in either English or the Filipino language.

Among the 196 respondents, 88.78 % have responded in English 11.22% in Filipino. 44.38% of the respondents are from the government sector, 26.02% from the information technology or engineering industry, 5.10% from the research and academe, 4.59% from the civil society, 4.08% from Internet/ telecommunications industry, 3.57% each are professional, online worker, and others, 3.06% from business, 1.53% are overseas Filipino workers, 0.53% from technical organizations.

## D.4 ADDITIONAL COLLABORATION AND PARTNERSHIPS

### *FUTURE VALUE OF DATA*

The DICT co-hosted the Future Value of Data Workshop on September 24, 2018 with Facebook Asia Pacific. The workshop brought together around 30 leaders and experts to explore and share views on the regional and global key changes in the area of data. The workshop was designed as a presentation-free event and instead focused on scholarly debate and discussion regarding the value of data arising globally. These issues included the role of data and its ownership, stemming from corporate entities collecting huge amounts of personal information and how they may exploit this data. The event also aimed to come up with possible solutions and recommendations to address the identified issues. This workshop was an opportunity for the DICT to better understand other participants' perspectives on the area of discussion and the DICT will be able to use the outputs of the workshop as inputs to NICTEF.

### *INDUSTRY IMMERSION*

The DICT also conducted industry immersions with various industry players. These immersions served as a venue for the DICT team to explore current technologies which may be useful in the crafting some of the initiatives to be laid out in the NICTEF.



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