

Bridging the Digital Innovation Divide:

A toolkit for developing sustainable
ICT-centric ecosystem projects



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Acknowledgments

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Innovation has many roles to play in achieving the Sustainable Development Goals. It helps ITU Member States transform their public sectors, resulting in improved service provision. It brings governments, civil society and the private sector together to develop digital solutions that enable sustainable and equitable development. And it helps create digital communities that can compete on a global scale, creating decent jobs and economic growth.

Goal 4 of ITU's Connect 2030 Agenda focuses on enabling ICT innovation in support of digital transformation. To fulfil this goal, ITU is committed to helping its membership and partners develop the technical know-how, common language, tools and frameworks to support the blossoming of digital ecosystems into competitive, innovative and inclusive environments that accelerate their economies' digital transformation.

Building on ITU's innovation toolkit series, this revised toolkit adds new tools and shares more insights on how stakeholders can undertake rapid ecosystem diagnosis, establish key recommendations, and develop flagship projects that effectively nurture ICT-centric innovation within their digital ecosystems.

It is designed for policy-makers, decision-makers, innovators and ecosystem builders seeking to build expertise in transforming ICT ecosystems into innovative powerhouses. Through a step-by-step process, this toolkit guides stakeholders in developing blueprints and recommendations that engage stakeholders in co-creation and help them identify gaps, amplify existing good practices and develop sustainable ecosystem initiatives tailored to unlocking their community's potential.

It is our hope that this toolkit will stimulate the development of successful ICT entrepreneurial communities, fostering technology start-ups that prosper and create jobs, supporting the growth of small and medium enterprises, and encouraging new public-private partnerships that fuel digital transformation.

The COVID-19 pandemic has reminded us how critical entrepreneurship-driven innovation is for economic growth and digital inclusion. This toolkit will enable countries, whether in the Global North or the Global South, to overcome the digital innovation gap.



Doreen Bogdan-Martin
Director, ITU Telecommunication Development Bureau

Executive summary

This toolkit is a guide to skills that will empower digital innovation ecosystem actors to turn a community into a thriving digital society.

Developing strong innovation ecosystems is a key component of national development, as innovation — especially in ICTs — is a driver of economic competitiveness and growth in modern economies. This document will help readers build ICT-centric innovation ecosystems that contribute to thriving communities.

Section 1 provides the reader with the language to understand an ICT-centric innovation ecosystem, defines “innovation” and “digital transformation”, and provides tools to measure ecosystem performance in their community. It provides additional background information on the current state of these ecosystems and why they are necessary in the digital era. The section additionally explores the challenges and opportunities facing most ecosystems and introduces the three engines of growth. Understanding these concepts is essential to a champion’s success in their innovation journey.

Section 2 provides an overview of how to acquire, practice and apply relevant new skills to the ecosystem. It contextualizes the stages along the journey at which each skill will be useful. It also lays out the essentials for organizing the ecosystem-building journey. There is an in-depth description of the tools and basic concepts mentioned in Section 1. Lastly, this section includes checklists to help prepare for the journey, as well as the investment a facilitator or ecosystem builder should consider making.

Section 3 provides case studies that demonstrate how to (i) use the tools introduced in the previous sections to assess ICT-centric ecosystems, and (ii) develop a project that creates an environment conducive to innovation. The first case study explains how to develop a digital innovation profile for an ecosystem. The second case study develops a flagship project to create a sustainable, nurturing environment for inclusive digital transformation. Both cases offer insights from applying the tools.

The conclusion helps to understand that if digital change makers in communities want to adapt to and survive in a fast-changing technological environment, ecosystems need to be ready to compete in an increasingly globalized digital economy.

The appendices provide additional information; namely supplementary tools and tips on diagnosing, developing and monitoring the performance of an ICT-centric ecosystem. These tools will help catalogue good practices, understand how to align strategies to accelerate digital transformation, conduct in-depth research and further assess key sectors of interest. The appendix also includes a glossary of commonly used terminology in the toolkit and images of the tools in use.

Out of the estimated 300 million start-ups in the world, very few of them will become high-growth firms because their ecosystems are missing essential elements for success. Despite strong efforts by stakeholders, policies and programmes are not adapting fast enough and are unable to cope with the exponential impact of new technologies. As a result, brain drain is accelerating as both talent and opportunities are migrating to better-performing ecosystems where they can grow.

It is therefore imperative for policy-makers, ecosystem builders, corporations, academia and civil society to understand how their communities can optimize their digital transformation capabilities.

This is the second toolkit designed by ITU to help strengthen ITU Member State capacity to integrate ICT innovation into national development agendas. This edition is more detailed than the previous *ITU 2017 Bridging the digital innovation divide: A toolkit for strengthening ICT-centric innovation ecosystems*¹ and offers specific steps to not only analyse, but also develop sustainable and impact-driven ecosystem projects to accelerate digital transformation.

¹ <https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/PolicyToolkit/D-INNO-TOOLKIT.1-2018-PDF-E.pdf>

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1 Understanding ICT-centric innovation ecosystems

This publication is designed to give all those who want to create an environment conducive to ICT innovation in their communities — ecosystem builders, policy-makers and innovation champions — the knowledge and tools they need to map, analyse and develop their ecosystems.

The International Telecommunication Union (ITU), the lead United Nations agency for information and communication technologies (ICTs), has a key role in ensuring that Member States are able to navigate technological changes. The ITU 2017 *Bridging the digital innovation divide: A toolkit for strengthening ICT-centric innovation ecosystems*¹ lays out the framework, tools and methodology to analyse the digital innovation divide. ITU has since used these tools to deliver several ecosystem reviews. The outcome has often been used to lay the foundation for national strategies and policies that foster ICT-centric innovation. However, more needs to be done to help develop concrete projects that create a sustainable enabling environment.

Box 1: Digital innovation to digital transformation

The OECD Oslo Manual¹ defines innovation as “a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit(process)”.

Technology continues to evolve at an incredible speed, boosted by the emergence of artificial intelligence (AI), Internet of things (IoT), blockchain, 3D printing, mobile services and social media. This digital innovation will help countries to achieve sustainable economic growth in line with the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) if the world can nurture the entrepreneurship needed to bring technology, innovation and development together.

Innovation addresses local and global problems, creates economic solutions and sustainable jobs, gives entrepreneurs and companies the incentive to develop their own communities and cities, and provides governments with the means to accelerate digital transformation.

Communities and stakeholders need to know how to leverage innovation to optimize opportunities. ICT affects business models, mindsets, organizational structures, R&D, markets and networks; therefore, ICT-centric innovation can contribute to significant growth and inclusion in economies that are increasingly digital, global and interconnected.

¹ OECD Oslo Manual : <https://www.oecd-ilibrary.org/docserver/9789264304604-en.pdf?expires=1581339627&id=id&accname=ocid54015561&checksum=529A2007DF256A63777B86F50F6FA57E>

Building on the ITU innovation toolkit series, this report is a practical toolkit for stakeholders to undertake rapid innovation ecosystem assessments and develop projects that effectively nurture ICT-centric innovation. This toolkit aims to enable and inspire successful ICT entrepreneur communities, resulting in technology start-ups that prosper and create jobs, from small and medium sized enterprises (SMEs) to corporations and unicorns (billion-dollar valuation companies), and to enable and inspire governments to be more responsive to citizen needs.

This toolkit introduces new tools for developing concrete projects with ecosystem stakeholders to the diagnosis and recommendation framework from the previous toolkit. Some of the previous tools have been revised for clarity and offer a more generalized context to enable all stakeholders — from innovators

¹ <https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/PolicyToolkit/D-INNO-TOOLKIT.1-2018-PDF-E.pdf>

themselves, to academia and other institutions — to champion ecosystem building. In addition, it provides the reader with a framework to develop impactful, ICT-focused innovation ecosystems.

This toolkit is for the ecosystem builder, the policy-maker or the innovation champion who wants to drive change in their community. By following its guidance, stakeholders will be able to replicate good practices and develop solutions and projects tailored for their communities.

This document enables positive, impactful change by nurturing an environment for ICT innovation in the community, city and country-wide.

1.1 Overview of an ICT-centric innovation ecosystem

Before exploring how to do rapid diagnosis or build ecosystem projects, this section sets out a basic understanding of ICT-centric innovation and ecosystems, develops a common language on digital transformation, and the ITU Digital Innovation Framework, as well as the engines of growth that lead to digital innovations.

What is ICT-centric innovation?

This toolkit, and the majority of the ITU Development Sector work on innovation, focuses specifically on innovation in ICT and the role of ICT in innovation. This is framed as ICT-centric innovation.

ICT-centric innovation has two main characteristics. First, it focuses on innovation and the development of the ICT sector itself. Second, it emphasizes the crosscutting role of ICT innovation in society. The creation of a dynamic ICT sector is a key component of international leadership in the global knowledge economy and the advancement of new technologies.

A strong ICT sector is critical to boosting foreign direct investment (FDI) and the presence of multinational corporations, improving the export orientation and competitiveness of sectors in the digital economy. It is a key driver of economic development in the knowledge world. The term ‘ICT-centric’ encompasses the ICT sector, the crosscutting role of ICT innovation, and the way in which innovation fosters the evolution of other sectors in the economy.

Box 2: Innovation and its impact on economies: A practical example

Innovation is a complex and often used concept. The previous toolkit argued that innovation is a system where different actors need coordinated action to drive results. These actions allow innovators to develop new products and services that achieve economic value.

A practical example of this is the transformation of the hospitality business through innovation in lodging, exemplified by Airbnb. This model brought together a mobile application, new business processes and practices, and asset ownership.

It helped transform the lodging sector by enabling owners to trade their assets for economic benefit. The owner of the innovation — Airbnb in this case— has had a significant impact on its target market. The impacts of innovation can be both positive and negative on communities and countries. If a community is a recipient of this innovation and not the producer, the impact can be dramatically different in terms of cost, jobs, inclusion and competitiveness.

While the underlying knowledge for the technology used by Airbnb is accessible to many countries, the right enablers and the right stakeholders may not be readily available in most communities to create similar services. These enablers, such as talent pool, R&D investment, markets and investment environments, are essential to unlocking the potential for the digital transformation of economies.

What is an ecosystem?

ITU defines an ecosystem as a system or network of interconnecting and interacting organizations and stakeholders, from multiple sectors, who come together and address the problems people are facing within their communities. The previous toolkit defined six key stakeholder groups, each with an important role to play at every stage of the innovation journey. See Box 3 for a refresher on the stakeholder groups.

Box 3: Stakeholders and the innovation journey

Academia: This group includes primary, secondary and tertiary institutions; research institutions and training centres. Academic institutions support the ecosystem by conducting primary research, helping to build the capacity of human capital and encouraging the development of young innovators.

Entrepreneurs: Entrepreneurs stimulate innovation by building companies that deliver novel solutions. They participate in all stages of the innovation lifecycle, from ideation to scale. Entrepreneurs can be leaders and champions in the innovation ecosystem and are generally supported by the other stakeholders.

Entrepreneurial support networks: These are the organizations within the ecosystem — such as innovation hubs, incubators, accelerators and associations — that support entrepreneurs. They guide start-ups through the development lifecycle, create a supportive culture and foster community. This group may also include media and other organizations who promote innovators¹.

Financiers: This category includes investors that support the different stages of the start-up lifecycle, from prototyping to initial public offering (IPO) for more mature companies. They include angel investors, seed funds, crowdfunding communities and platforms, venture capitalists, private equity investors, grant providers (such as NGOs) and impact investors. Actors that fund ecosystem-building activities are also included.

Private sector: This sector includes large and mature corporations, established SMEs and groups that represent the interests of the private sector, such as chambers of commerce. Typically, these companies engage in the innovation ecosystem to explore opportunities to disrupt their traditional business models or provide services to other businesses.

Public sector: This stakeholder group includes policy-makers and regulators who are active in the innovation ecosystem, along with other actors such as international organizations and civil society groups. Given the crosscutting nature of ICT, public sector actors represent many areas of work, such as finance, trade, communications and technology, along with other verticals that might be influenced by ICT-centric innovation.

¹ Terms adjusted based on additional input from work by David Shelters

What is digital transformation?

Digital transformation is a term that can be confusing for many stakeholders. Most narratives surrounding digital transformation come from the private sector. Governments have traditionally been involved, but many focus on government transformation (such as building e-government services).

Digital transformation is what happens when innovation, using ICTs and telecommunications, is applied to problem solving. The benefits to a country and its people are immense: significantly increased productivity, economic growth and increased employment opportunities.

It can range from digitization, which refers to transitioning manually performed services into computerized services (such as codifying analogue processes), to digitalization, which implies more substantial adjustments to underlying processes.²

Box 4: Digital transformation elevator pitch

Digital transformation is essential for regulators and policy-makers who are looking to address current and significant challenges related to achieving the 2030 Agenda and the SDGs. These issues include social challenges such as ageing populations and access to health, education and decent jobs, as well as competitiveness in the global market. Technology and innovation are crucial throughout all stages of addressing these challenges: knowledge sharing, guidance, collaboration, conceptualization, design, funding and implementation of solutions.

Public sector actors who are looking to break down barriers, embrace their digital futures and close the digital divide must take full advantage of the development that digital transformation can bring to their societies.

Traditional approaches to ICT— which tend to be narrow, siloed and limited in scope and impact — differ from digital transformation, which provides sustainable, inclusive, people-centred, cross-sectoral and tailored solutions. Digital transformation requires the active engagement of multiple actors and cultural change to blend technologies. This helps to address socio-economic, political and environmental challenges to improve lives, business performance and efficiency.

The degree to which digital transformation is successful depends on the capabilities of an ICT-centric innovation ecosystem. This requires stakeholders to understand their responsibilities and their capacity to deliver on them.

Understanding the enabling environment

In previous work, ITU has identified several pillars that are critical to integrating ICT innovations into a country's development agenda. This capacity is what nurtures digital transformation, and as discussed earlier, ecosystem stakeholders play critical roles in achieving this.

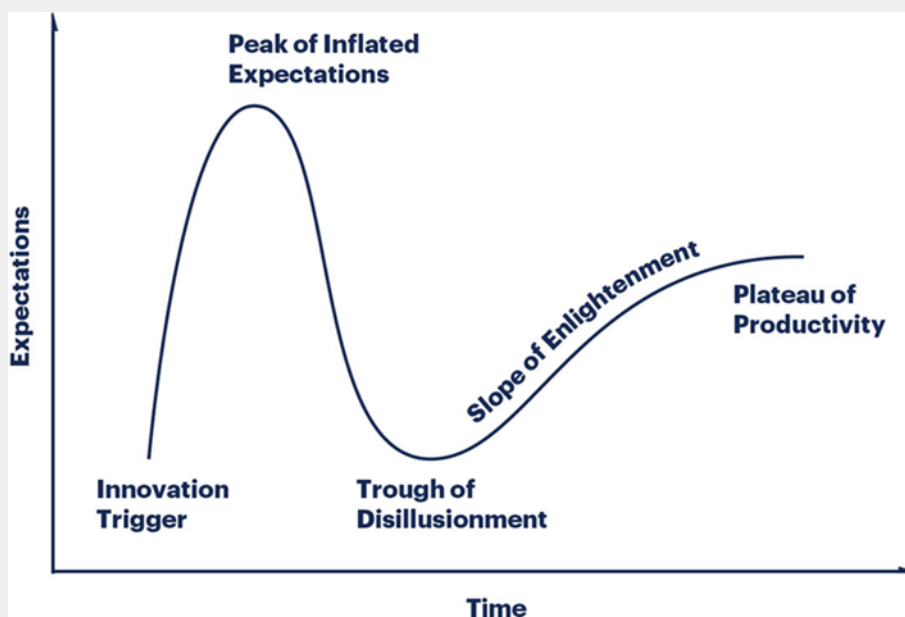
² See <https://www.forbes.com/sites/jasonbloomberg/2018/04/29/digitization-digitalization-and-digital-transformation-confuse-them-at-your-peril/#45d7e92e2f2c>

Box 5: Gartner Hype Cycle and the enabling environment

Technology is not the root cause of change, but an enabler. Ecosystem stakeholders must leverage technology to create solutions that address market needs.

Research firm Gartner creates “Hype Cycles”¹ for most technologies. A Hype Cycle highlights the potential for new technologies to solve real problems and find opportunities in the global market. The cycle illustrated in Figure 1 shows a longitudinal view against market expectation as the technology evolves through five phases: the innovation trigger, peak of inflated expectations, trough of disillusionment, slope of enlightenment and plateau of productivity.

Figure 1: Gartner Hype Cycle



Source: Gartner.inc

The innovation trigger phase is where the technology needs experimentation, proof of concept stories and media hype. In this phase, the technology is not yet a usable product, nor is it commercially viable.

In developed countries, technologies such as AI and blockchain have commercial viability because the mature ecosystems are able to make the business case and secure markets in old and new industries. However, in less developed economies with immature ecosystems, the application of technologies such as AI and blockchain may be in an innovation trigger phase because very few business cases have been developed for the problems specific to their economies.

¹ <https://www.gartner.com/en/research/methodologies/gartner-hype-cycle>

Gartner defines the “peak of inflated expectations” as when “the expectations for [an] innovation rise above the current reality of its capabilities. In some cases, an investment bubble forms, as happened with the web and social media”¹.

For example, although AI and blockchain may have some commercial viability today, especially for developing economies, the questions of who the innovation producers and consumers are for this technology remain. Even if a few business cases develop in less mature ecosystems, they may not make it to commercial viability or scale up. Economies that are innovation producers reap the most benefit from technological diffusion. Consequently, an ecosystem and its readiness to leverage any technology to create needed solutions is critical to economic inclusion and job creation.

Global hype about many technologies in the past have produced little return for less developed economies. Many Third Industrial Revolution² technologies, such as open source software and SSID, have failed to help developing countries leapfrog digital development. Today, a fourth industrial revolution is bringing technologies such as artificial intelligence, 3D printing, distributed ledger, and IoT.

Without a mature ecosystem, economies cannot navigate the peaks and valleys of technological change. As a result, quality talent in less mature ecosystems often migrate to more mature ecosystems; compounding the problem and making digital development less likely.

¹ <https://www.gartner.com/en/documents/3887767>

² The Third Industrial Revolution, also referred to as the Digital Revolution is considered to be the period between 1950 and the turn of the twenty-first century.

ITU has laid out key factors that characterize the environment that each stakeholder faces in an innovation journey. They are: (a) vision and strategy, (b) infrastructure and programmes, (c) talent and champions, (d) capital and resources, (e) markets and networks, (f) culture and communities, and (g) policy and regulation.

The key ingredients for an innovation journey should be distributed, abundant and available throughout a country. Key factors and components that enhance, foster and facilitate digital transformation are clearly clustered and organized in Figure 2.

Figure 2: Key factors and components of an enabling environment

Pillars	Vision and strategy	Capital	Market	Infrastructure	Talent	Culture	Policy
Issues	Scope and objectives	Appropriate demand-side resources	Integration of economic sectors	Inclusive digital infrastructure	Talent appropriateness	Sustainable culture of entrepreneurship and innovation	Comprehensive and grassroots innovation policies and programmes
	Aligned digital strategies	Continuum of supply-side resources	Market access domestic and international	Resilient and secure broadband infrastructure Soft infrastructure	Champions	Communities	Legal frameworks

Source: ITU

In an innovation ecosystem, entrepreneurs and innovators need policies, initiatives and specific support programmes to ensure successful digital transformation. To properly navigate the changing

environment, countries must analyse the needs of society and respond continually with appropriate programmes and policies.

In many countries, however, the institutional capacity needed to adjust policies and programmes to the needs of the digital innovation ecosystem may lag behind. This is important because every community or city has a specific comparative advantage that may require enhanced integration with its innovation ecosystem to maximize its potential.

The ITU Digital Innovation Framework, first published in 2017 in the Albania country review³ offers a comparative framework for diagnosing an ecosystem using seven pillars, an innovation journey map, six stakeholder groups and tools to enable policy experimentation. The framework enables a thorough assessment of a country's capabilities to produce ICT innovations. It identifies the necessary enablers and barriers countries are facing in their digital transformation journey.

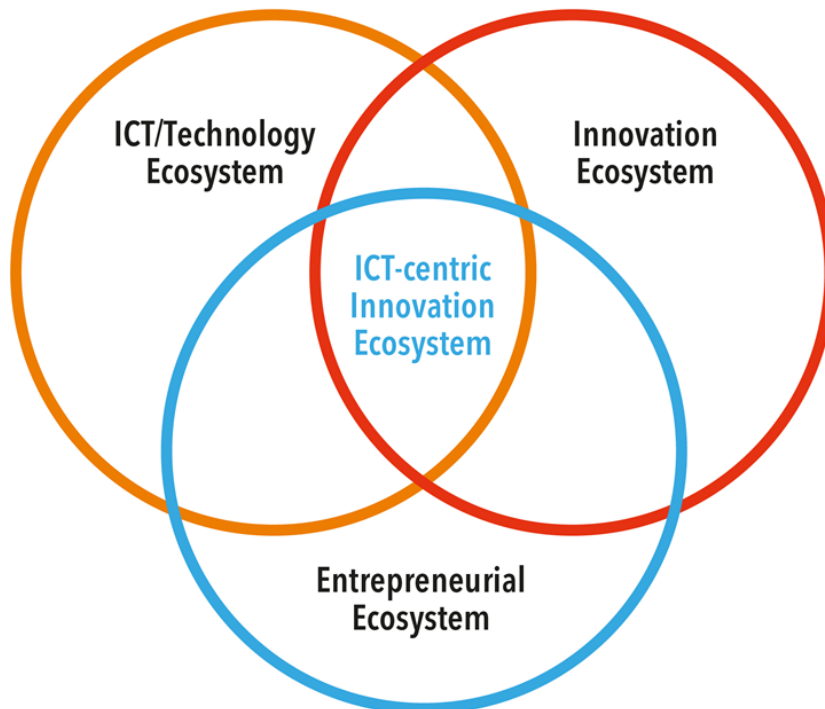
Three engines of growth for digital transformation

With an understanding of the enabling environment, it is important to step back and look at the macro environment in which a country's ICT-centric ecosystem exists to create a digital transformation of the economy.

Three main ecosystems fundamental to a country's digital transformation journey must come together to allow innovation to flourish. They are the national innovation ecosystem, entrepreneur ecosystem and technology ecosystem. These three ecosystems interlink to form a country's innovation landscape, from ideation to market.

In Figure 3, the Venn diagram depicts the relationship between these three ecosystems.

Figure 3: ICT-centric innovation ecosystem and three engines of growth



Source: ITU

³ <https://www.itu.int/en/ITU-D/Innovation/Documents/Publications/Albania%20Country%20Review%20Innovation%20June%202016.pdf>

National innovation ecosystem: The national innovation ecosystem — which includes research institutions, academia, and public sector entities such as national innovation agencies and public financial institutions — plays an invaluable role in the national innovation journey, particularly in kick-starting innovation.

Entrepreneur ecosystem: This includes the entrepreneurs, their support systems and the organizations that initially nurture the formation of enterprises and subsequently nurture their growth as small and medium-sized businesses (SMEs). Often, technology start-ups that have the potential to become high growth companies do not fulfil their potential because of the lack of a market or high-growth business model.

Technology ecosystem: The technology ecosystem includes high-growth technology companies and the ecosystems that support them. These include high tech companies, their original equipment manufacturers, system integrators, firms in ICT sectors and business-to-business (B2B) technology platforms supporting SMEs. These companies and their ecosystems are integrated into local or global value chains. This ecosystem development is critical to a country's ability to leverage technological innovation and to create high-growth industries and jobs.

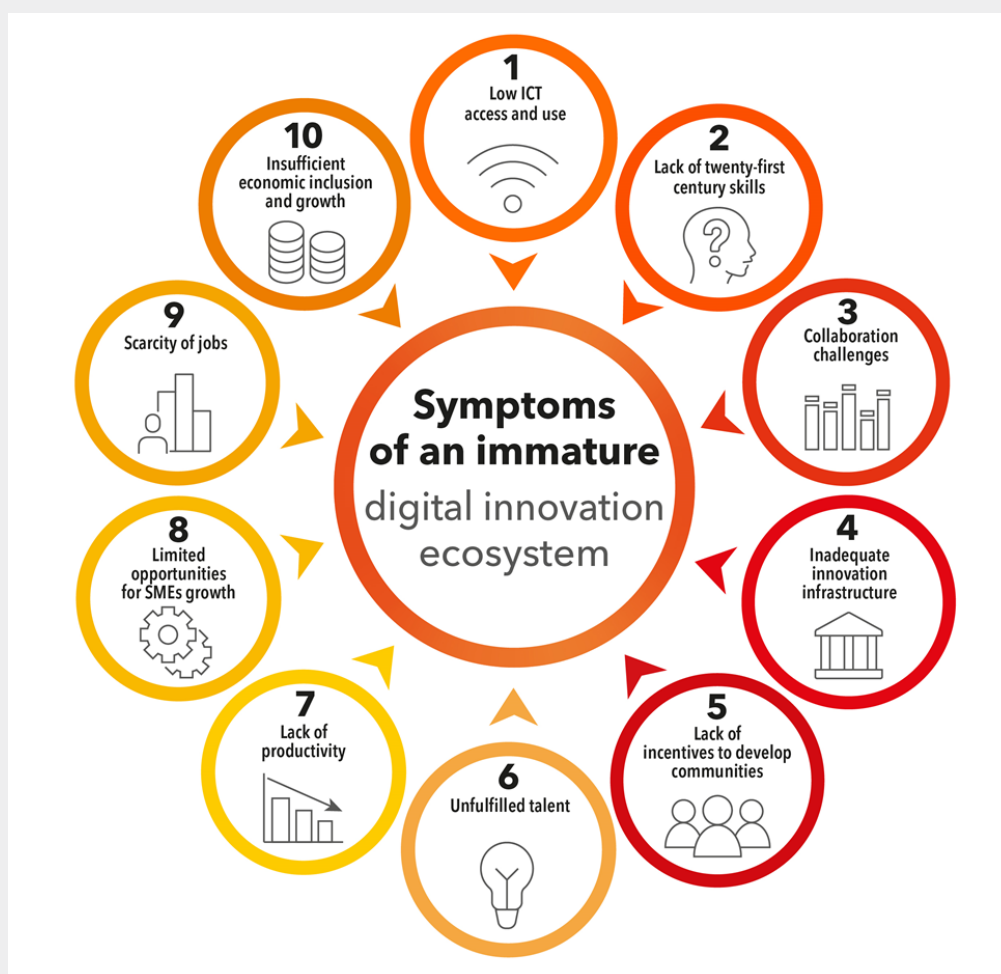
There are challenges and opportunities that each ecosystem can face, as well as ones that affect all three.

- National innovations agencies and science and research labs are prominent in many countries. As a result, the national innovation ecosystem is often operational but not efficient. This can be assessed using efficiency ratio indicators found in the World Intellectual Property Organization (WIPO) Global Innovation Index.
- Support for the entrepreneurial ecosystem is more recent, gaining prominence with the rise of public entrepreneurial support programmes. Some countries have invested heavily in this ecosystem through state development enterprises (such as *Serviço Brasileiro de Apoio às Micro e Pequenas Empresas* in Brazil and the Small Enterprise Development Agency in South Africa). However, coordination and collaboration with other stakeholders is often lacking, and there is usually a big gap between public and private initiatives due to the absence of trust between stakeholders.
- The technology ecosystem, on the other hand, is newer and most likely immature in many economies, especially those in the Global South. In this context, this ecosystem is primarily driven by international technology companies with weak local value chain integration.

Box 6: Symptoms of an immature ICT-centric innovation ecosystem

The main roadblock to delivering outcomes is the fragmentation of the aforementioned ecosystems. This fragmentation exists both between and within them, limiting their ability to fulfil their roles. Consequently, many ecosystems face challenges in accomplishing the tasks that will result in the ecosystem success (high growth industries, high skilled talents, world-class exports). Ecosystem fragmentation and stakeholder inability to play their roles in nurturing their environment have identifiable symptoms depicted in Figure 4.

Figure 4: Symptoms of an immature digital innovation ecosystem



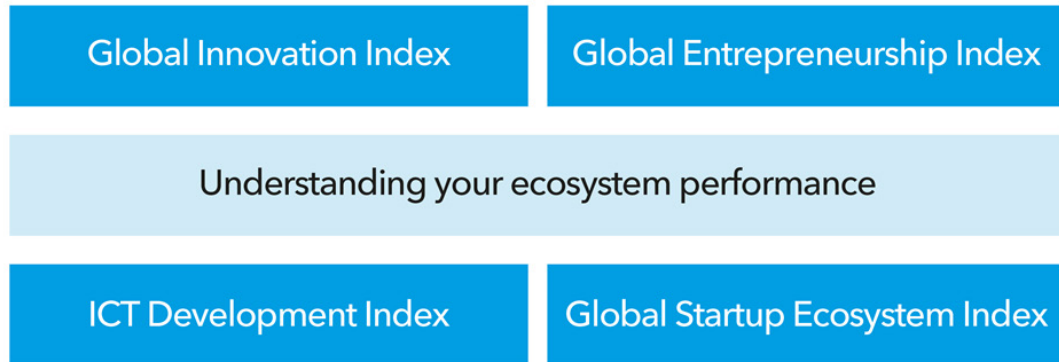
Source: ITU

1.2 Understanding ecosystem performance

The previous section discussed common innovation language, briefly reviewed the ITU Digital Innovation Framework and introduced the three engines of growth essential for digital transformation of an economy. This section reviews several indices that can help measure various indicators of ecosystem performance.

There are many global indices to assess ecosystem performance, each focusing on specific issues such as innovation, entrepreneurship, start-ups or ICTs. This section will review some of these indices and provide insights on their strengths and weaknesses.

Figure 5: Global indexes to assess ecosystem performance



Source: ITU

Global start-up indices

Most people, when asked about the best performing start-up ecosystem in the world, would name Silicon Valley, owing to its reputation. However, they will struggle to provide a comparative assessment of their home-grown ecosystem. Table 1 shows the top 20 global start-up ecosystems from Startup Genome⁴, a company that ranks and rates start-up ecosystems.

Table 1: Top 20 global start-up ecosystems (2019)

Top 20 global start-up ecosystems	Ranking	Top 20 global start-up ecosystems	Ranking
Silicon Valley	1	Seattle	12
New York City	2	Toronto	13
London	3-4	Singapore	14
Beijing	5	Amsterdam	15
Tel Aviv	6-7	Austin	16
Shanghai	8	Chicago	17
Paris	9	Bangalore	18
Berlin	10	Washington, D.C.	19
Stockholm	11	San Diego	20

Source: Startup Genome

The Startup Genome index measures pillars such as talent, market reach, experience and funding flows. These measures are related to a strong technology ecosystem and entrepreneurial ecosystem performance. However, the data used for the analysis focuses more on reputational top cities than other qualitative information needed to explain dynamic ecosystems.

⁴ <https://startupgenome.com/reports/global-startup-ecosystem-report-2019>

Global Innovation Index

The Global Innovation Index (GII) is a collaboration between leading global universities and WIPO. It helps countries to better assess their innovation performance by collecting innovation metrics according to international standards⁵. GI measures various key innovation metrics to understand the strength and weaknesses of countries in their innovation performance. This index primarily focuses on the broader national innovation ecosystem. Some indicators touch on the impact of the entrepreneurial and technology ecosystems.

The 2018 GI reported on seven pillars:

1. institutions (political, business and regulatory environment);
2. human capital and research (primary, secondary tertiary education; R&D);
3. infrastructure (ICTs, general infrastructure, ecological sustainability);
4. market sophistication (credit, investment, trade, competition and market scale);
5. business sophistication (knowledge workers, innovation linkages and knowledge absorption);
6. knowledge and technology output (knowledge creation, impact and diffusion); and
7. creative outputs (intangible assets, innovative goods and services, online creativity).

One-hundred twenty-eight economies were assessed in the 2018 edition of the GI. Providing a comprehensive index of key innovation performance, collecting, tracking and acting on 80 indicators can be a daunting task for many stakeholders, especially developing countries who do not have the institutional capacity.

ITU ICT Development Index

The ITU ICT Development Index (IDI) measures key metrics highlighting national performance of ICTs. It is a global indicator index that assess a country's development towards the information society. It is widely used by policy-makers, telecommunication companies, regulators, researchers and international organizations. It is often used in other indicators including the GI, OECD data, World Bank data and more.

The main objectives of the IDI are to measure⁶:

- the level and evolution over time of ICT developments within and between countries;
- progress in ICT development in both developed and developing countries;
- the digital divide, i.e. differences between countries in terms of their levels of ICT development;
- the development potential of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.

IDI offers insights about the performance of the technology ecosystem through globally comparable data about ICT readiness (infrastructure and access), use (intensity) and capability (skills).

In 2018, ITU IDI measured the three key pillars and fourteen indicators:

1. Access sub-index:
 - a. households with a computer;
 - b. households with Internet access;
 - c. international Internet bandwidth per user;

⁵ Cornell University, INSEAD, and WIPO (2018): The Global Innovation Index 2018: Energizing the World with Innovation. Ithaca, Fontainebleau and Geneva.

⁶ https://www.itu.int/en/ITU-D/Statistics/Documents/statistics/ITU_ICT%20Development%20Index.pdf

- d. population covered by 3G mobile networks and
 - e. fixed-broadband subscriptions by speed tiers.
2. Use sub-index:
- f. individual using Internet;
 - g. active mobile-broadband subscriptions per 100 inhabitants;
 - h. mobile-broadband Internet traffic;
 - i. fixed-broadband Internet traffic and
 - j. mobile phone ownership.
3. Skills sub-index:
- k. mean years of schooling;
 - l. secondary gross enrolment ratio;
 - m. tertiary gross enrolment ratio and
 - n. individuals with ICT skills.

Global Entrepreneurship Index

One of the leading indexes for assessing the performance of the entrepreneurship ecosystem is the Global Entrepreneurship Index (GEI). GEI is produced by the Global Entrepreneurship and Development Institute, a research institute that “advances knowledge on links between entrepreneurship, economic development and prosperity”⁷ GEI is a collaborative effort between scholars from four leading academic institutions: Imperial College of London, the London School of Economics, George Mason University and the University of Pécs.

GEI measures 14 key metrics that relay the dynamism and performance of entrepreneurial ecosystems:

1. opportunity perception;
2. start-up skills;
3. risk acceptance;
4. networking;
5. cultural support;
6. opportunity start-up;
7. technology absorption;
8. human capital;
9. competition;
10. product innovation;
11. process innovation;
12. high growth;
13. internationalization and
14. risk capital.

One of the strengths of this index is its focus on opportunity-based entrepreneurship and the specific conditions needed to nurture entrepreneurship. While GEI is a recognized index with a validated approach in specific policies and international circles, it is not done under any global mandate from

⁷ <https://thegedi.org/theinstitute/>

member states, but instead relies on the GEDI, a United States of America based institution to champion its continued development. Additionally, most of the key metrics used are from quantitative data and may not offer dynamic insights into an entrepreneurial ecosystem performance.

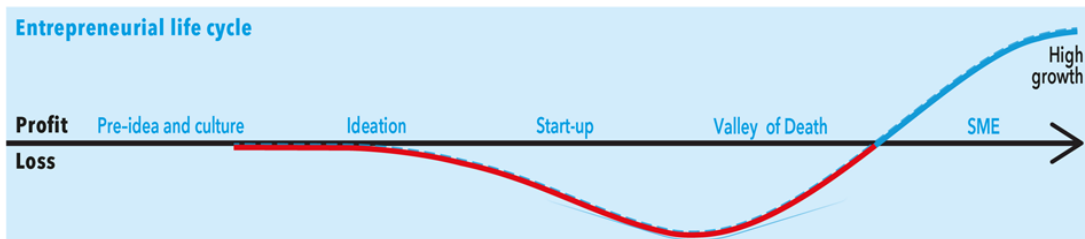
The next section focused on understanding stakeholder actions and how they can contribute to this shared environment.

1.3 Steps to close the digital innovation gap

To understand the steps that must be taken to generate desired results (the digital transformation of society), the entrepreneurial lifecycle explains how innovators can move from ideas to creating small and medium sized businesses (SMEs), high-growth firms and, ultimately, international export.

In most countries, the majority of the working population is employed in sustainable SMEs, while high-growth firms, in collaboration with these SMEs, determine the country's competitiveness. The capacity of entrepreneurs to take ideas to market is the biggest factor in a community for inclusive economic growth.

Figure 6: Entrepreneurial lifecycle and the innovation journey



Source: ITU

Figure 6 reflects the lifecycle of a company, and notably identifies the “valley of death”, a period after ideation when innovators require significant investment and support, and where there is a high risk of business failure. A successful innovation ecosystem supports as many innovators as possible to cross the valley of death and establish companies that may eventually become high-growth firms.

Box 7: Job-to-be-done framework and the innovation journey

Harvard economist Clay Christiansen, while studying company theory of disruptive innovation, realized that the traditional ways in which companies deliver products and services to serve the market could be ineffective in creating competitive solutions and lasting companies.

According to the *Harvard Business Review*, “Thirty thousand new consumer products are launched each year. But over 90 per cent of them fail—and that’s after marketing professionals have spent massive amounts of money trying to understand what their customers want.”¹

¹ <https://hbr.org/2005/12/marketing-malpractice-the-cause-and-the-cure>

This observation led to new insights on marketing segmentation theories where the traditional business school approach of segmenting the customer base and designing value based on specific benefits is unsustainable. The research observed that customers hire a product or service for a specific purpose or job. Both the purpose and how the customer will use the product or service need to be known to have a competitive solution.

The job to be done is the customer's need which the product or service fulfils. If a product or service does not answer a need or a general desire, it is unlikely to sell, no matter how innovative it is.

Organizations that focus on the job to be done, and continuously leverage technology or new processes to get this job done better (for customers) are disruptive and sustainable, as their customers will continue to hire their products or services.

Most statistics show that 90 per cent of SMEs fail in their innovation journey because they cannot sustainably deliver the right products and services. Yet they are expected to be the engine for job creation and grow into be mature firms. What is the job-to-be-done by stakeholders to ensure that innovation flourishes?

The entrepreneurial lifecycle, as discussed previously, shows what must be done to create growth and economic inclusion. Therefore, for an innovation-driven economy to be competitive, the job to be done is to nurture this journey so that ideas can be developed into businesses.

The job to be done does not change from country to country, or from community to community. However, the approach and methods can change based on the context (such as available opportunities) and stakeholder actions. For example, in Silicon Valley, financiers have a strong appetite for high growth and collaboration, which means that they will support innovators much longer through the valley of death until they can figure out a strong global business model that creates high-growth firms.⁸ The case of Uber, a high-growth firm, illustrates this.

In locations with fewer resources and limited collaboration, stakeholder actions may end up creating barely sustainable innovation that does not grow. Without access to the right resources and collaboration, innovators will lack appropriate talent to create strong businesses, an enabling policy environment that supports them or access to value chains from established corporations.

1.4 Challenges of ICT-centric innovation ecosystems

Based on ecosystem studies done by ITU in numerous countries, four fundamental issues inhibit ICT-centric innovation ecosystems: (a) resource access, (b) ecosystem practices, (c) organizational agility and (d) a common vision and agenda. Figure 7 shows the four core challenges of an ICT-centric innovation ecosystem.

⁸ Blitz-scaling book, Reid Hoffman, founder LinkedIn

Figure 7: Core challenges of an ICT-centric innovation ecosystem

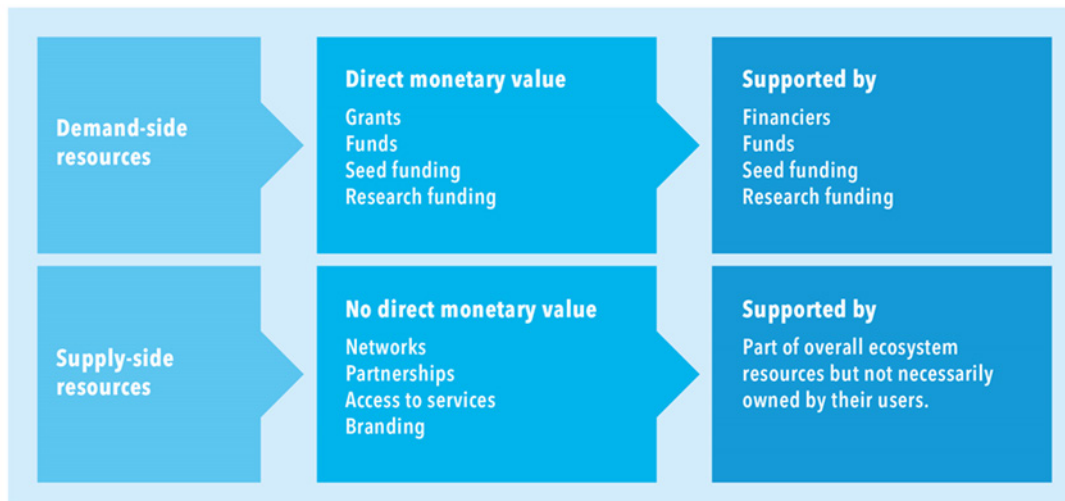


Source: ITU

Resources access

Stakeholders in an ecosystem need resources to undertake activities and deliver on objectives. However, many ecosystems lack access to essential ingredients. Without resources, an entrepreneur’s journey through the valley of death looks more like a journey through an abyss from which there is no return. There are two type of resources: supply side and demand side.

Figure 8: Demand- and supply-side resources



Source: ITU

The term “supply-side resources” refers to money from specific sources such as funds, grants, seed funding and research funding. These resources can also include all monetary assets (derived from investment, borrowing or revenues) and tangible, secured or soon-to-be secured assets. They are

primarily supplied by financier groups such as banks, venture capitalists, private equity firms, angel investors and other funders.

Access to such financial resources is critical to enabling innovators for purchasing basic requirements, paying salaries, and acquiring products and services. It is the most flexible source as it is equivalent to money, which is a store of value that can be exchanged for other services.

Demand-side resources, on the other hand, have no direct monetary value, bearing more resemblance to bartering. These resources include networks; partnerships; access to certain services, partner value chains (e.g. distributors, suppliers, customers); branding; infrastructure (e.g. research centres, innovation hubs); knowledge and intellectual property, to cite a few.

These demand-side resources are part of the overall ecosystem resources but are not necessarily owned by the organization or stakeholder using them. They are needed by entrepreneurs as a bootstrapping strategy,⁹ which refers to entrepreneurs achieving goals using self-sustainable resources; or required by other organizations as part of an open innovation ecosystem strategy. IBM, for example, donated 500 licences to the open source community to enable IP sharing and greatly contributed to advancing the global open innovation community¹⁰.

Box 8: Accessing resources – is there really a funding issue?

“If you want to go fast, go alone. If you want to go far, go together” -- African Proverb

There are plenty of resources from both the demand and the supply side. Many development agencies have earmarked funds to invest in bankable projects. However according to experts on financing mechanisms¹, in many cases less than 1 per cent is earmarked for ICTs.

More funding is available from the private sector, with the top global companies having accumulated trillions of dollars in cash-equivalent resources.² These funds, however, are typically returned as dividends to shareholders³ or used to buy growth through acquisition. So, how can stakeholders access resources in cash-strapped economies?

Resources can be accessed in various ways, including strategic alliances, licensing and partnerships, extension of a value chain or ecosystem, or through trust between organizations and stakeholders.

The bottom line is that stakeholders need to develop bankable projects that achieve results. However, this is easier said than done.

¹ Expert Panel on Building Vibrant ICT Centric Innovation Ecosystems: Financing Mechanisms for Accelerating Digital Transformation, WSIS Forum, 2018, Geneva, Switzerland

² <https://www.bloomberg.com/graphics/2017-overseas-profits-tax/>

³ <https://www.economist.com/business/2017/06/03/tech-firms-hoard-huge-cash-piles>

Organizational agility

Many stakeholders work in silos due to a lack of trust. Their organizational structures and processes inhibit productive collaboration that would be conducive to ICT-centric innovation. As a result, strategies and actions are needed to drive opportunities within the organization or as part of the broader ecosystem.

⁹ Bootstrapping strategies, D. Shelters

¹⁰ <https://www.cnet.com/news/ibm-offers-500-patents-for-open-source-use/>

Collaborative organization strategies and execution capacity determine success in an ecosystem. Because traditional organizational structures are still built on a centralized model (command and control), they offer benefits (productivity within specialized units) and disadvantages owing to their inherent tendency to create silos in the markets and communities they serve. They tend to be inflexible, unconnected or struggle to adapt to the globally changing competitive environment.

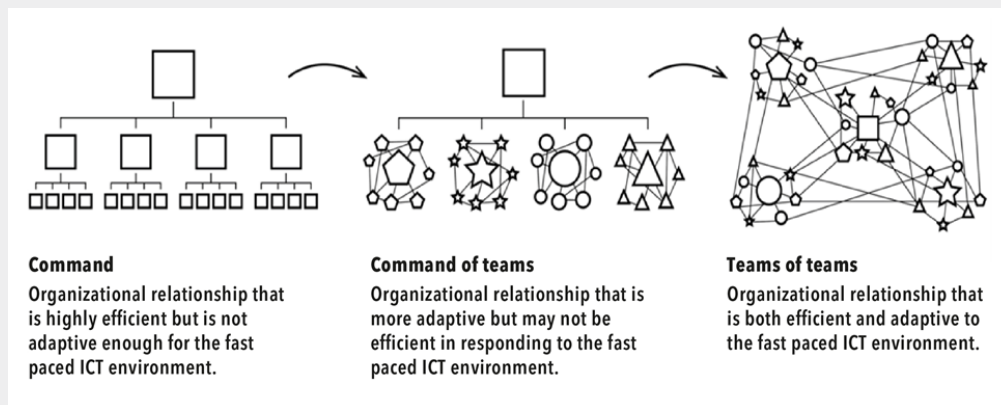
Box 9: Mega trend — from command and control to adaptive

“The organization’s competency is based on a set of cohesive capabilities and how fast and effective they can be built upon”.

— Pearl Zhu, *Digital Capability: Building Lego like Capability into Business Competency*

The image below, inspired by the book *Team of Teams*¹, shows how institutions can adapt in today's increasingly complex and hyperconnected world. Creating competitive digital transformation capabilities will require this paradigm shift from stakeholders and their institutions, moving from a command-centric view to a team-of-teams model.

Figure 9: Command and control vs. self-managed team of teams



Source: Adapted from *Team of Teams*

¹ S.A. McChrystal et al., *Team of teams: new rules of engagement for a complex world*, Portfolio/Penguin, New York, NY, 2015.

Shaping organizations will also require a shift in stakeholders’ mindset. According to research conducted by LRN¹¹, organizations that are self-organizing have more trust in their hierarchy and are consequently 32 times more likely to take risks, 11 times more likely to innovate and perform 6 times better than rigid organizations. If organizations and the stakeholders who work for them can embrace agile approaches, they will be more likely to be competitive and create sustainable growth.

Ecosystem practices

With an estimated 300 million start-ups around the world, few ecosystems have the right innovation fabric to help their start-ups develop into the next unicorn. Failure to continuously upgrade practices and provide key resources, policies and programmes are the key reasons why many ecosystems do not produce unicorns.

¹¹ <https://howmetrics.lrn.com/#report>, 2016, source LRN

The innovation process is dynamic and requires the interaction of a variety of factors, such as R&D investment, talent pools, culture, economic conditions, markets and investment. The ICT-centric innovation ecosystem is complex, requiring coordination between its different building blocks to drive results.

In an ecosystem, programmes and policies need to adapt constantly due to the changing environment. Stakeholders must have the ability to update their processes — based on good practice — to achieve impact. Without this, innovators struggle to unlock opportunities, limited resources are wasted, and ICT innovation cannot reach market or create an innovation-driven economy with high-growth industries, highly skilled jobs and world-class exports.

An ecosystem may have several identified practices that nurture the innovation environment. Each practice needs to be able to adapt to address changing issues. Good and bad practices exist in every ecosystem. Bad practices stifle innovation and should be avoided, while good practices should be amplified.

Box 10: Continuous improvement and the need for best practice

In *Out of the Crisis*, published in 1982 by the Massachusetts Institute of Technology (MIT), Deming describes a causal relationship where improved quality leads to decreased cost of production, increased productivity, gains in market share, survival of the organization, and job security. He argued that “The production worker in Japan, as anywhere else in the world, always knew about this chain reaction; also, that defects and faults that get into the hands of the customer lose the market and cost him his job”.

This demonstrates that the deep-seated culture of quality in Japan created jobs and markets. It also created highly skilled workers who could compete globally.

This causal relationship is similar to that of an innovation journey. If ecosystem practices are continuously upgraded, innovators will increasingly transform ideas into viable solutions, small and medium business will flourish and grow into competitive global companies, and ultimately, the ecosystem will benefit from new jobs.

In an interconnected global ecosystem, policies and programmes must constantly evolve. If they do not, ecosystems will lose resources, talent and opportunities to better performing ecosystems. Countries should ensure that their policies are robust and appealing to local talent. If not, once innovators reach the limit of their growth potential, they will migrate to neighboring or even distant ecosystems to allow them to grow. Therefore, continuous improvement of practices is essential.

Vision and common agenda

As the digital economy expands into non-ICT sectors, many countries envision using technology to leapfrog digital development. However, their existing policies and programmes may not be comprehensive enough to address opportunities in their economies. Without a common vision, it is difficult to engage stakeholders in sustainable digital transformation.

The innovation journey requires that each stakeholder have a common understanding of opportunities for and challenges to creating growth. Without this understanding, very few growth synergies can exist.

For well-established ecosystems such as Silicon Valley, much of the vision and common agenda is unwritten because it is already part of the culture of the organizations and stakeholders; and has been built through decades of habits and success stories. However, for less developed economies there may be a need to introduce a clearly articulated vision and common agenda. Having a clear vision and a common agenda is necessary to build a culture of ICT-centric innovation.

Building a culture of innovation for less mature ecosystems requires ecosystem champions who can rally everyone around a common cause and drive initiatives. Without them, the capabilities and good practice required for a dynamic ecosystem will be deficient. It is therefore essential to recognize and encourage champions who can lead stakeholders to buy into a common vision and agenda.

To enable proper guidance in the fast-changing technological environment, stakeholders need to have an aligned vision to drive economic benefit from innovation.

2 Developing sustainable ecosystems

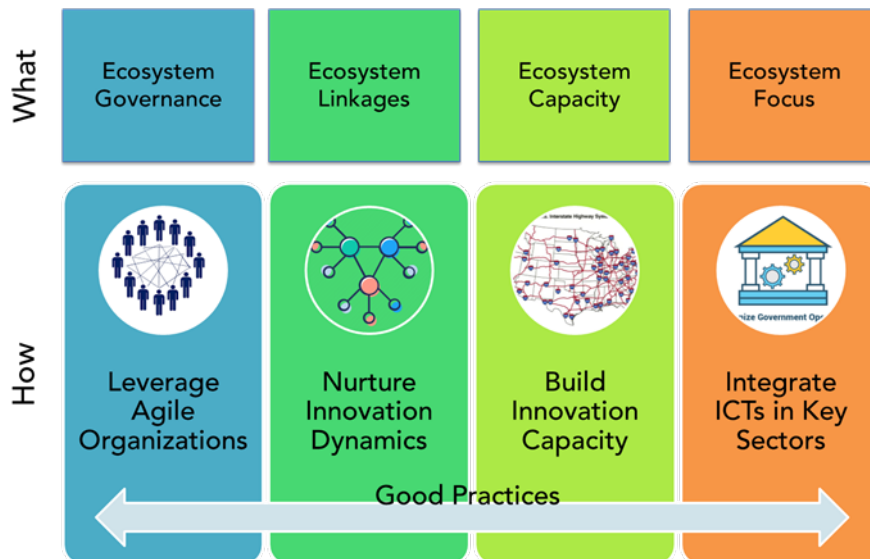
Having built a common vocabulary around an ICT-centric innovation ecosystem in the previous section —what it is, how to measure it and what its challenges are— this section will explore the opportunities to develop resilient ecosystem initiatives that receive the engagement and buy-in of stakeholders, as well as achieve their objectives. This section will share insights about ecosystem building, present a framework for developing projects and introduce a toolbox with a summary of each tool.

2.1 Opportunities to create sustainable ecosystems

Through extensive primary and secondary research with over 130 cases from 50 countries, ITU has uncovered specific opportunities for strengthening the capacity of a community to accelerate digital development.

There are four key opportunities that must be addressed in any ecosystem to enable its competitiveness: (a) governance; (b) linkages; (c) capacity and (d) focus. These building blocks, when underpinned by good practice, enable an ecosystem to be vibrant and competitive.

Figure 10: Four key opportunities to accelerate digital transformation



Source: ITU

Without proper governance, linkages, capacity and focus, innovation ecosystems can falter. In globally connected ecosystems and open economies, only the strongest innovation will dominate value chains.

Ecosystem governance

The main concern in an innovation ecosystem is collaboration: stakeholders must exchange resources to deliver an outcome. It is important to have an agile, responsive governance model that holistically addresses the needs of the community. Many ecosystems falter without it, as dominant players will kill smaller, more innovative players, regardless of their geographical boundaries.

Because of silos in traditional organizations, it is imperative to have organizations with flexible and active governance models. Traditional innovation agencies may claim ownership in solving this problem, but the reality tells a different story. These innovation agencies mostly belong to the national innovation ecosystem limiting their reach into the other two ecosystems that need to come together.

Most organizations supporting the ecosystem are still structured using twentieth-century approaches, which often do not meet the needs of emergent behaviours in the global economy. They tend to be

rigid and unconnected to the changing global ecosystem. As a result, their support to stakeholders outside of their mandate is limited. There are a few existing organizations that care about such challenges, but they are few and far between, and their scope often is limited.

Box 11: Building agile organizations – Good practice: digitalswitzerland

Mission and vision

Digitalswitzerland is a cross-industry association created from its members' shared vision. It aims to strengthen the country's position as a digital hub and to project those benefits across the whole of Switzerland in sectors such as finance, medical technology, the life sciences, and fashion.

Activities

Its members have launched several initiatives, focusing on three key areas: attracting outstanding digital talent, helping existing companies master digital challenges and strengthening the start-up and innovation ecosystem in Switzerland.

Governance and resources

The organization is led by an executive committee that leads concrete projects in the operational phase; while a steering committee shapes the digitalswitzerland overall strategy. The organization is decentralized with two offices in the country. The organization has a clear structure. Project managers drive its activities. They are supported by a communications and relations team that supports all activities.

Digitalswitzerland is financed through yearly fees from over 120 members from various stakeholder groups: leading companies, organizations, academia and politicians, who come together to prepare Switzerland for its digital future.

Achievements

In 2019, nearly 300 000 people participated in Digital Day, its flagship event, which “[makes] digitalization a tangible experience, highlighting its opportunities and challenges and encouraging an in-depth discussion”¹. Digital Day included 300 events in 12 locations around Switzerland.

Digitalswitzerland also hosts the Innovation Challenge, which invites “leading minds in Switzerland to tackle societal problems by finding digital solutions”². In 2018, eleven projects around innovation came to life, including an app and entire ecosystem around the prevention of hypertension, and a start-up that established an ecosystem with institutions and employers distributing verified certificates to employees on blockchain.

There were also educational initiatives, such as *nextgeneration*, coding camps for kids, and *educationdigital*, a platform that offers education around all things digital.

In total, leads about 20 projects with specific outcomes and holds more than 25 events each year throughout the country.

Source: ITU research and digitalswitzerland survey

¹ <https://www.digitaltag.swiss/en/about/>

² https://digitalswitzerland.com/press/challenge-mediakit_en/

2.1.1 Ecosystem linkages

The right ecosystem can be both an inspiration for innovation and a source of competitive advantage. Ecosystems need strong linkages that provide a suitable business environment, innovation readiness, and entrepreneurs to develop appropriate technology solutions.

The creation of a favourable business environment requires a digital transformation roadmap with clear vision, strategy and development of key initiatives. The environment must be dynamic and able to adapt in response to its stakeholder needs. Achieving innovation readiness often requires a change to enabling policies, regulations and rules, balancing the analogue and new digital economy. Again, the key to innovation guidance is the ability to nurture the right environment without restricting its growth.

Nurturing entrepreneurs to develop appropriate technology solutions means fostering start-ups. The dynamic of start-ups in technology sectors is an important indicator of technological performance. To catalyse the entrepreneurial ecosystem consisting of large firms, start-ups, universities and governments, the key is not only the roles these entities play, but also the interactions between them.

A holistic approach to nurture linkages should allow support for innovation through all stages (from working on the right problem, to getting the right education and providing funding) in order to start and grow innovative businesses.

Creating ecosystem linkages is therefore contextual. It requires specific policies and programmes, and flexible approaches that deliberately understand and set policies to support the dynamism of digital innovation and entrepreneurship. It requires policy experimentation through co-creation and adequate sandboxes.

A dynamic innovation environment requires a regulatory setting that is coherent and that can guide, facilitate and promote innovation culture, mindset, projects and programmes. Building innovation dynamics includes finding mechanisms to ensure that the ecosystem is working and creating linkages that accelerate digital transformation.

Box 12: Nurturing innovation dynamics: Israel Innovation Authority

Mission and vision

Originally established in 1965 as the Office of the Chief Scientist of the Ministry of Industry and Trade, the office became the Israel Innovation Authority (IIA) in 2016. The IIA mission is to promote innovation for inclusive and economic growth in Israel, particularly through cultivating a strong entrepreneurial culture, facilitating the creation of strong technological infrastructure and creating highly skilled human capital.

Activities

The IIA provides services through a variety of programmes, which fall under three main areas:

Human capital: improving the skills of Israel's talent pool, drawing more talent into the country. Examples include:

- **The Israel National Brain Gain Program.** This was created to incentivize Israelis with international experience, particularly in high-tech industries, to back to Israel; and
- **The Coding Bootcamps Program.** This programme increases the number of skilled, high-tech personnel in the Israeli workforce. It engages skilled foreign workers and returning Israelis.

Infrastructure that enables a more vibrant entrepreneurial culture. Examples include:

- **The Innovation Labs Program,** which funds technologically advanced labs that run on an innovation model to encourage cooperation between tech entrepreneurs and industrial corporations engaged in advanced manufacturing.
- **Ideation (Tnufa) Incentive Program,** which funds technological ventures and encourages technological entrepreneurship in its pre-R&D phase.
- Investment in research and development at all stages of technological development and in all branches of innovation.

Enabling programmes that cultivate more innovation and creativity, including:

- **Innovation Visas Program for Foreign Entrepreneurs.** This programme enables entrepreneurs to stay in Israel for a up to 24 months, during which they can receive support from the Tnufa Program;
- **The Multinational Corporations' R&D Centers.** This creates incentive for multinational corporations' R&D centres in the biotechnology and medicine fields to establish themselves and expand in Israel; and
- **The Global Enterprise R&D Collaboration Program.** This is a one-stop shop for Israeli start-ups (with an annual revenue not bigger than USD 70 million) looking to collaborate with multinationals.

Achievements

The IAA supported 1 115 projects from 650 companies in 2016. One hundred seventy-nine entrepreneurs received support from the TNUFA Program and 135 companies received support from the Beginner Companies Program.

Governance and resources

The IIA council is the body responsible for supervising its operations and outlining its direction. It is led by a CEO, and composed of six primary innovation divisions, each offering customized and comprehensive incentives programmes. The divisions are: (a) Start-up; (b) Growth; (c) Technological Infrastructure; (d) Advanced Manufacturing; (e) International Collaboration and (f) Societal Challenges.

2.1.2 Ecosystem capacity

Exposure to environments that encourage innovation— that is, environments provide both inspiration and support— is important and should be widespread. They encourage people to work together to solve problems and share knowledge, thereby fostering a collegial and progressive work environment where talent, opportunities and resources meet.

Historically, innovation environments of this kind existed primarily in well-funded university research labs or inside companies. Over time, however, they have evolved into the open innovation model, allowing organizations to create and capture value more effectively and offer adaptive platforms on which firms can innovate while increasing productivity. With changing values coming from a globally connected ecosystem, open innovation platforms are becoming essential for competitiveness.

Innovation hubs, tech parks, lab programmes and other similar arrangements involving multiple stakeholders have proliferated in the past few years to address the growing needs of ecosystems. Whether formal or informal, innovation infrastructure is essential for building ecosystems' innovation capacity, and are usually clustered around higher-learning institutions. The keys to their success are linkages, cross-stakeholder collaboration and a problem-solving focus. However, their availability is limited.

Exchange between universities and industry is an important facet of public-private collaboration, as innovative ventures are often driven by technologies that come from basic research and pass through technology transfer channels on the way to commercialization. Universities play a key role in developing technological innovations because they can offer various mechanisms to support ideas to market and adapt curricula.

However, many universities are still operating as traditional organizations and not adapting fast enough to the changing environment. New and renewed global partnerships are needed to accelerate their transformation into leading innovation centres.

Box 13: Building innovation capacity: Small Enterprise Development Agency (South Africa)

Mission and vision

The Small Enterprise Development Agency (SEDA) promotes entrepreneurship and develops small enterprises and cooperatives by providing customized, non-financial business support services and stimulating disruptive innovation. SEDA's vision is "to be the centre of excellence for small enterprise development in South Africa"¹.

¹ <http://www.seda.org.za/AboutUs/Pages/Home.aspx>

SEDA was established in December 2004 through the National Small Business Amendment Act, Act 29 of 2004. Its mandate includes the integration of government-funded small enterprise support agencies across all tiers of government. SEDA is modelled after SEBRAE, its Brazilian counterpart.

Activities

SEDA helps develop business and marketing plans, including providing links to financiers, courses, seminars, workshops, networking events, mentorship programmes, online brochures, publications and annual reports.

SEDA and the Small Enterprise Finance Agency (SEFA) collaborate to strengthen access to finance for small enterprises. SEDA supports SMEs and cooperatives in their preparation for SEFA loan applications. SEDA closes the gap between financial support for entrepreneurs and innovative ideas for investors by leading initiatives such as Pitch and Perfect, which consists of pitching masterclasses and competitions.

The SEDA focus on youth entrepreneurship is marked by the growing portfolio of entrepreneurship centres and rapid incubators that target youth entrepreneurs in underserved areas, as well as the Entrepreneurship in Schools programme.

Through coordination and partnership with different players, including global partners who make international best practices available to local entrepreneurs, SEDA works to develop, support and promote SMEs across the country, ensuring their growth and sustainability.

Achievements

SEDA reported that they supported 60 new and previously existing incubators between the last quarter of 2017 and first quarter of 2018 and created over 2 200 jobs.

Its 2016 to 2017 priorities included building partnerships with higher-learning institutions. SEDA created five new partnerships to this end. Concretely, this means that 2 181 graduates received entrepreneurship education and support, who in turn established 142 micro-, small- and medium-sized enterprises (MSMEs) or cooperatives.

The SEDA capacity to implement programmes through its regional network was recently reflected in a government services decentralization plan, which will result in the Department of Small Business Development (DSBD) transferring programmes to SEDA. Among these are the Informal and Micro Enterprises Development Programme (IMEDP), Enterprise Incubation Programme (EIP) and the Cooperative Incentive Scheme (CIS).

Governance and resources

SEDA is under the direction of DSBD, which is led by the Minister of Small Business Development. SEDA is led by a CEO who reports to the Board of Directors, which oversees the activities of the agency.

Ecosystem focus

Focused ecosystems allow innovations to emerge in unconventional ways across governments and businesses by reinventing their value chains. If established players fail to embrace focused approaches to collaboration, they will increasingly be unable to respond to competitive threats.

Ecosystem focus is essential to building competitiveness in globally connected digital economies; and will allow innovative enterprises to succeed in scaling in the public or private sector.

In the public sector, innovators need access demand such as government initiatives with e-services. In the private, focusing on unlocking unique opportunities within a country is essential. This demand helps the innovator obtain test references, validate their product, establish credibility and grow. It satisfies government needs for accelerated public service transformation to meet citizen needs and economic growth through key sectors. Without this demand, they are likely to struggle and remain small.

In the private sector, collaborative strategies are the most interesting, as they allow a start-up partner to profit from the resources and backbone of a large corporate partner, and corporate partners benefit from the ideas and concepts, possibilities to test ideas quickly and outside complex structures, access to new technologies, rapid prototyping, as well as the entrepreneurial spirit and start-up culture. Such collaboration enables innovative ventures to scale up for the benefit of everyone concerned. It is not enough to support innovation in isolated sectors or simply use traditional products and services to drive benefits.

However, this collaboration often does not happen as most ecosystems are fragmented across the three engines of growth. As a result, innovators are unable to target problems in specific sectors in need of digital transformation, as they lack a coordinated continuum of support needed to enhance their chance of success.

To unlock the competitiveness of key sectors, universities must work in partnership with corporate and risk capital stakeholders; global corporations in partnership with universities and governments; governments in collaboration with universities and corporate stakeholders; and the entrepreneurial community in partnership with government and industry.

Major changes are needed in government, academic and corporate concepts of innovation: a change in internal approaches to innovation, and in external relationships between traditional and non-traditional stakeholders and the environment. Without this, profound digital transformation of value chains within and across industries will stagnate.

Box 14: Integrating ICT innovation into key sectors: Corallia

Mission and vision

Corallia is the first initiative to manage and develop innovation clusters in knowledge-intensive and export-oriented technology segments where the capacity to build sustainable innovation in Greece ecosystems exists.

Corallia acts as cluster facilitator by implementing targeted support actions which involve all innovation ecosystem actors. Its vision is “A Greek environment with the right framework conditions to allow sciences, innovation and entrepreneurship to flourish (again)”¹

Activities

Corallia operates two EBN-qualified business and innovation centres. The *π1-innohub*² has been in full operation since 2011 and the *α2-innohub*³ opened its doors in 2014.

¹ <http://www.corallia.org/en/about-corallia.html>

² This hub is a bridge that connects innovation, research and advanced technological developments. It primarily dedicates resources to start-ups. SMEs also benefit from using it to access the market and talent pool of western Greece.

³ This hub fosters cooperative competition between successful high-tech companies.

Corallia is one of the founding members of three European Strategic Cluster Partnerships, working on semiconductors, space and creative industries under a European Commission-supported initiative. These partnerships, representing over 2 000 companies and partner institutions including many SMEs, share a joint strategy to promote cross-sectoral cooperation and facilitate SME internationalization in new “rising star” areas.

They implement coordinated support actions to unleash the innovative capacity of SMEs, improve their performance and increase their competitiveness as well as nurture cross-sectoral innovation through the development of new industrial competitive value chains.

Corallia has a series of initiatives to stimulate and promote youth entrepreneurship with partners and donors in Greece and abroad. Corallia has also implemented a significant number of successful projects to support of businesses as they launch and commercialize high-tech products and services. In addition, it has facilitated access-to finance-activities for companies to fund research and innovation activities and successfully turn innovative ideas into products.

Achievements

To date, Corallia has supported the development and facilitation of three highly specialized innovation clusters with more than 170 members (SMEs, large companies, international design centres, start-ups and universities) that collaborate towards the development and growth of their respective industries.

The mi-Cluster, a nano/microelectronics-based systems and applications cluster, is the first innovation cluster in Greece. The si-Cluster is a space technologies and applications cluster working to make Greece a leading country for space technologies and applications. The gi-Cluster is the gaming and creative technologies and applications cluster, which boasts a state-of-the-art technology edge.

Governance and resources

Corallia is a unit of the Research and Innovation Center in Information, Communication and Knowledge Technologies, known as ATHENA RIC. It falls under the auspices of the Hellenic Ministry of Education and Research.

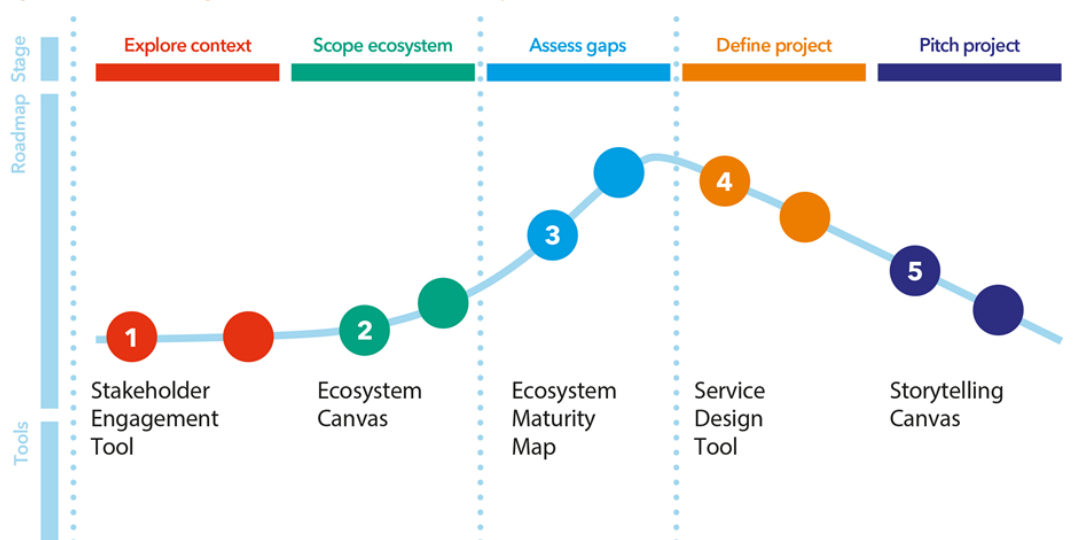
2.2 Analysis framework

The ITU methodology for developing an environment that is favourable to ICT-centric innovation is based on the principle of empowering innovation champions by providing them with the tools to develop their own ecosystems. Before delving into the tools, the analytical framework will be explored. This framework guides project development and provides an overview of essential know-how to diagnose and enhance an innovation ecosystem.

2.2.1 Understanding the ecosystem development roadmap

In a physical journey, an explorer decides on an objective, for example climbing Mount Everest, and must consider many elements to ensure success. They must know who their team members are, be well prepared and be equipped with the right tools. The same applies when undertaking an ecosystem journey. Figure 11 demonstrates how stakeholders can prepare for the ecosystem development journey.

Figure 11: Five stages of the innovation ecosystem framework



Source: ITU

There are five stages and ten tools that are used to develop a project.

1. **Explore context:** The first stage focuses on exploring the basic constraints of the ecosystem and mapping the stakeholders. This stage provides an overview of the bigger picture of the ecosystem before drilling down for details and helps understand both the stakeholder challenges and the problems they are trying to solve.

Two tools are available for this stage: the Stakeholder Engagement Tool and the Qualitative Interviewing Tool. This stage requires interaction with stakeholders, either by conducting primary research or through a co-creation workshop approach.

2. **Scope ecosystem:** This stage focuses on understanding the key enablers of the ecosystem, developing a common agenda, and identifying which enabling environment(s) supports ICT-centric innovation.

For this stage, one tool is available, the Ecosystem Assessment Canvas. This is the most difficult stage as this is where one finds the most information during the project development journey using co-creation and requires at least one full-day workshop with participants. This stage is a checkpoint for the buy-in of stakeholders in the room, especially if previous interaction was through one-on-one interviews.

3. **Assess gaps:** The third stage focuses on assessing the gap in the overall job to be done. It helps narrow the scope down to ecosystem-building projects, prioritizing based on design constraints.

Two tools are available for this stage: the Ecosystem Maturity Map and the Sector Development Canvas (optional). This stage signals a turning point, as you will shift from exploring the ecosystem in depth to identifying the real systemic issues or focus of the ecosystem. The Ecosystem Maturity Map development requires, at minimum, a half-day workshop. The Sector Development Canvas requires a half-day focus group interview.

4. **Define project:** This stage defines the projects and prioritizes the options, which helps to narrow the scope of the proposal by identifying concrete actions needed in the ecosystem. The end result is a skeleton of your project based on good practice, sound objectives, potential KPIs, preliminary resources and relevant stakeholders.

For this stage, one tool is available, the Service Design Tool.

5. **Pitch project:** At this stage, the concrete project developed earlier is packaged for selling to resource owners and to get the ecosystem buy-in.

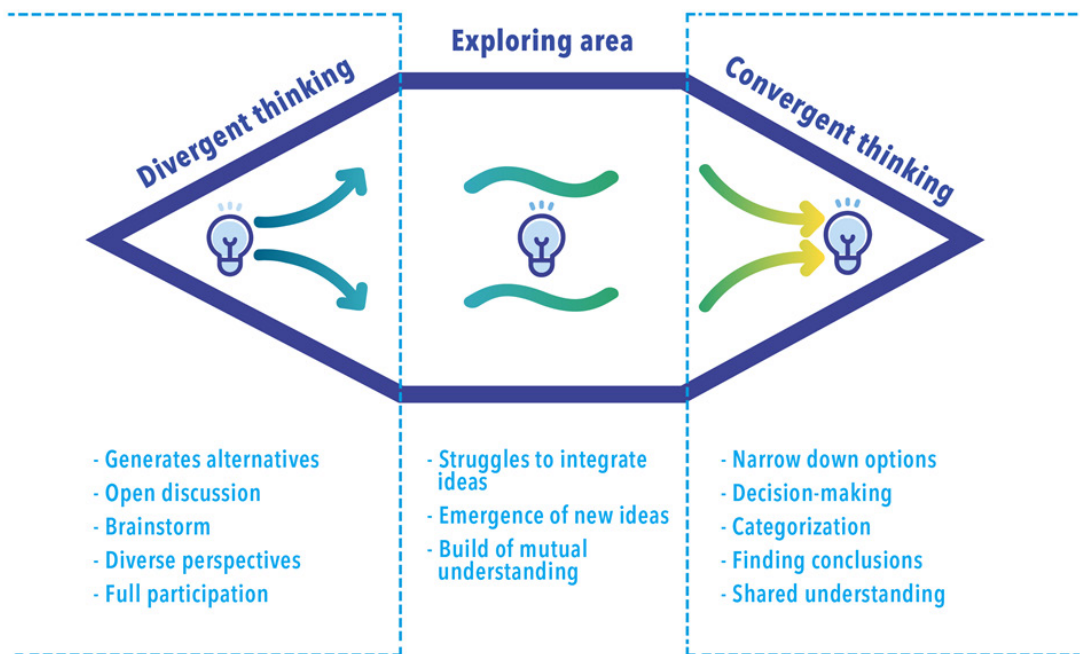
For this stage, one tool is available, the Storytelling Tool. The result is a developed, remarkable ecosystem project. This stage requires a half-day workshop with participants.

The five stages of the innovation ecosystem framework are based on the logical structure of the information needed to lead from one stage to another. However, as previously discussed, innovation is a complex process; thus, these stages do not necessarily need to follow a linear pattern.

2.2.2 Using the innovation tools

It is recommended to use both divergent and convergent thinking to gather the necessary information when using each tool. Divergent thinking is similar to brainstorming, exploring as many ideas as possible without shutting them down. Convergent thinking is when ideas are narrowed down. Each tool has been designed to be used with creativity methodologies, which are participatory in nature. This approach enables new ideas to emerge and develop with the shared buy-in of participants.

Figure 12: Divergent-convergent thinking



Source: ITU

Divergent step: This starts a better understanding of the unknown, usually by asking open-ended questions. This step is ideation and must be broad and inclusive of diverse stakeholders to gather sufficient data. Data collection can be complemented by desktop research. It is essential to find relevant problems to address. Every tool has key words and questions associated to aid in this step.

Emergent step: Here, questions bind the project scope to the relevant key metrics. If problems run beyond the core capabilities of the stakeholders or the scope of the work, that is an indication that the problems to be solved should be limited, or the scope expanded. Every tool must come with an objective, which limits the scope of the tool.

Convergent step. This step responds to challenges through problem solving. It is essential to solve the root cause(s) of a problem, not merely its symptoms. Using closed-ended questions¹² or affinity groups (group with a shared interest or common goal) can help to reduce the idea to its essential components.

¹² Closed-ended questions have a limited set of possible answers such as yes or no.

Box 15: A growth mindset

A mindset is a disposition, attitude or inclination. Innovation champions with a growth mindset learn and grow from the challenges of creating ICT-centric innovation ecosystems. It is important to share and collaborate with other stakeholders when using the innovation tools along the ecosystem-building journey. Innovation requires a growth mindset that allows individuals to create better ICT-centric innovation ecosystems. The following are elements of a growth mindset that drive innovation:

- **Problem-driven solutions:** Workshop participants tend to focus so intently on their ideas that they forget they are meant to be solving real ecosystem problems. The workshop facilitator must consider whether all stakeholders are in alignment with the ICT-centric innovation ecosystem vision.
- **Inclusion:** When trying to solve problems, it is easy to find solutions that fail take into consideration the needs of *all* stakeholders involved. Throughout the workshop sessions, the facilitator must ensure that an exploratory scope of ideas is achieved *before* reducing them.
- **Empathy:** Understanding who is involved at each stage and having the ability to put yourself in their shoes is empathy. Empathy is required to use any innovation tool. The solutions and goals must align with and respond to stakeholder challenges.
- **Co-creation:** This refers to collaborating on equal ground and building on different perspectives. An innovation environment needs to respect different points of view. The workshop facilitator should encourage and inspire fair dialogue between participants. All feedback should be constructive.
- **Egoless:** Humility is incredibly useful (self-importance gets in the way of innovation) especially when workshop participants have different ranks. The facilitator should set the rules of the dialogue in advance to help participants nurture empathy and question the intentions behind ideas.
- **Driven:** To be driven is to have grit and determination to achieve an objective. It does not mean to be stubborn and inflexible. Creating ICT-centric innovation ecosystems is a process that requires time and effort; therefore, to get results, being driven is a crucial part of the growth mindset.

At the beginning of the ICT-centric innovation ecosystem creation process, there is usually a sense of chaos that may feel disorienting for participants. This is followed by an emergent stage where workshop participants need to converge on the ideas. In the last stage, participants use design constraint to narrow down their options and delineate final ideas. The key to *organized* chaos is to keep participants focused on the desired outcome: solve the problem. It helps to set the rules for brainstorming sessions beforehand. Some recommended rules include:

- withholding judgement,
- proposing ideas based on personal capacity not an official role,
- giving every participant a chance to contribute and
- having a neutral moderator.

2.2.3 Designing your journey

The ecosystem-building journey is comprised of a series of workshops and interviews designed to achieve certain goals. In earlier sections, a metaphorical journey composed of stages was described. This is one way to organize the sessions as a journey.

Another way to organize sessions is to explore objectives and pick the tool that can best help to achieve them. Each tool can be used independently, although there is a sequencing to build an ecosystem project. Table 2 provides an overview of tools that may be useful depending on the goal(s).

Table 2: Choosing the right tools

Goal	Tools needed (not exhaustive)
Understand common needs and the general environment.	<ul style="list-style-type: none"> Stakeholder Engagement Tool Qualitative Interviewing Tool
Create empathy between stakeholders.	<ul style="list-style-type: none"> Stakeholders Engagement Tool
Write a stakeholder manifesto.	<ul style="list-style-type: none"> Ecosystem Canvas Tool
Understand the current landscape.	<ul style="list-style-type: none"> Ecosystem Canvas Tool
Develop an ecosystem maturity map for your community or city.	<ul style="list-style-type: none"> Ecosystem Maturity Map
Assess digital transformation in a specific sector.	<ul style="list-style-type: none"> Sector Development Canvas
Create an outreach story for a project.	<ul style="list-style-type: none"> Storytelling Tool
Develop a rapid assessment.	<ul style="list-style-type: none"> Desktop research Qualitative Interviewing Tool Ecosystem Assessment Canvas Ecosystem Maturity Map Good Practice Canvas
Develop a flagship project.	<ul style="list-style-type: none"> Desktop research Qualitative Interviewing Tool Ecosystem Assessment Canvas Sector Development Canvas Ecosystem Maturity Map Service Design Tool Storytelling Canvas
Develop a digital transformation strategy and roadmap ¹³	<ul style="list-style-type: none"> Desktop research Qualitative Interviewing Tool Ecosystem Assessment Canvas Sector Development Canvas Ecosystem Maturity Map Priority Matrix Canvas Project Canvas Tool

¹³ See the ITU toolkit: Bridging the Digital Innovation Divide.

Most of the tools in Table 2 can be found in this report, its appendices, or in previous ITU innovation toolkits. These stand-alone tools can also be used collectively to achieve an objective in a journey. It is advisable to start with basic tools, such as the desktop research,¹⁴ and qualitative interviewing tools, to develop a knowledge of the ecosystem before holding workshops. Workshops are more effective when a user has a basic understanding of the issues and embraces a growth mindset of the **problem-driven solution, inclusiveness, empathy, co-creation, egoless and driven**.

2.2.4 Preparing for sessions

All tools in this document have been designed using participatory innovation processes as a baseline requirement. Most tools require interaction with ecosystem stakeholders, space to conduct workshops, and materials to be used during the workshops.

Design brief

Preparing a workshop requires drafting a brief or concept note for participants. It should touch on relevant points and be shared with all participants to prepare them for the workshop. The following are suggested elements in a design brief format to capture in the concept note:

- **Contact person:** Who is the main focal point? What is their role?
- **Expected goal and vision:** What is the end goal or destination for the end of the workshop or series of workshops?
- **Problem statement task:** What is expected of participants?
- **Relevance and importance:** Why is this initiative important and relevant to them?
- **Challenges and opportunities:** What challenges and opportunities can participants relate to?
- **Design constraints:** What political, organizational and personal constraints need to be addressed during the workshop? What other constraints, if any, do you foresee?
- **Target group:** Who are the participating stakeholders?
- **References:** What substantiating references, toolkits, information stories, visions or strategy documents do participants need in order to understand the context?

The concept note resulting from the design brief should be shared in advance to ensure stakeholder engagement. Special attention should be paid to finding multiple relevant parties to co-sponsor the workshop.

Participants

A key step in the workshop preparation is to gather a list of participants. Table 3 provides a checklist for workshop stakeholders and target group participants.

¹⁴ See Appendix A for instructions on how to conduct desktop research.

Table 3: Stakeholders and participants for workshop preparations

Stakeholder Group	Number of participants	Check when there is at least one representative
Government This group may include tourism, finance, education and IT/ICT ministries; ICT regulatory agencies; stock market regulatory agencies; commerce, agriculture, SME promotion and science and innovation commissions.		<input type="checkbox"/>
Entrepreneurs This group may include small companies, start-ups, scale-ups and pre-idea individuals from different sectors.		<input type="checkbox"/>
Corporate This group may include telecommunication companies, ICT companies, established SMEs and associations.		<input type="checkbox"/>
Entrepreneurial support networks This group may include incubators, accelerators, mentor networks, industry associations, ICT chambers of commerce, ICT media organizations, cluster organizations and technology parks.		<input type="checkbox"/>
Academia This group includes researchers, professors, universities, business institutions and vocational schools		<input type="checkbox"/>
Financiers This group includes central banks, traditional banks, non-traditional banks, angel investors, venture capital and private equity firms.		<input type="checkbox"/>

Having determined who will be represented, another important consideration is how much time will be allocated for each tool, the materials to be used by participants and the physical space where the workshop will take place. Recommended materials and guidelines for each tool are listed below.

Materials

- Sticky notes (yellow, blue, and red)
- Round stickers (red, green, yellow, and blue)
- Black and red markers and pens
- Assorted coloured markers
- A3 paper
- Tape and blue tack
- A flipchart
- Tools factsheet (enough copies for everyone)

Resources

- Facilitator:** At least one person in charge of leading the sessions. If it is a large group, more facilitators may be needed, but a skilled facilitator can easily handle 80 people in a room.
- Participants:** 5 to 10 participants from each stakeholder group.

- **Average time spent per tool:** 2 hours.
- **Operations personnel:** Responsible for booking the room, sourcing and facilitating, marketing materials (i.e., posters, banners, outreach), etc.
- **Logistics personnel:** Responsible for communicating information to the participants and team; keeping everyone updated, touching base before and after each workshop event, distributing data.
- **Videographer/photographer:** Secure resources for video recording and high-end photographer for documenting the session outcomes. Do not record everything. Make sure participants know the recording is only for documentation purposes.

Space

The room should allow participants to move around. It is recommended to avoid a classroom-style set-up; round tables are preferred; tables to accommodate 6 to 10 people (i.e. 10 tables for 80 participants).

Box 16: Tips: Creating a knowledge wall

A *knowledge wall* is a means of collecting aggregated information for analysis.

Group structure

If there are more than seven participants, the session should start by dividing the participants into smaller groups. Experience has shown that brainstorming is much less effective in groups of more than seven people.

Ideally, there should be at least one representative from each stakeholder group.

Working on the knowledge wall

If the entire group has fewer than seven people, participants can work directly on the tool or canvas placed on the knowledge wall through open discussion using both divergent and convergent thinking techniques (see appendix C).

When there are multiple groups, it is recommended that each group use a flip chart to create their own *knowledge wall* for each tool or canvas pillar through divergent thinking. After the open discussions, groups should decide what to keep through consensus and transfer the information to the main knowledge wall. This convergent thinking creates the final version.

Creating the final knowledge wall through brainstorming applies divergent-convergent thinking processes and reflects a design thinking approach highlighted in Box 15:

- withhold judgement,
- propose ideas based on personal capacity not an official role,
- give every participant a chance to contribute and
- have a neutral moderator.

Pre-event checklist

The following checklist ensures nothing has been forgotten.

- I have completed the stakeholder checklist and there is a stakeholder from each group represented in the sessions.
- I have identified the tools I will be using depending on my goal.

- I have ____ (no. of attendees) copies of the participant's guide.
- I have ensured logistics for the event are in place.
- I have sent a video and audio release form.
- I have effectively disseminated information about the event.
- I have all the materials for the event:
 - Sticky notes (yellow, blue and red).
 - Round stickers (red, green, yellow and blue).
 - Black and red markers and pens.
 - Assorted coloured markers.
 - A3 paper.
 - Tape and blue tack.
 - A flipchart(s).
 - Tool factsheets (enough copies for everyone).
- I have established a benchmark for each session.
- I have prepared a participant list, why the participants need to be there, key concepts and critical information.

Box 17: Tips for the sessions

- Reinforce the main concepts: innovation; ICT-centric, innovation-driven ecosystem; ICT centric, innovation-driven economy, digital transformation, national vision, any other relevant idea.
- Discuss the desired design constraints in your design brief.
- Take notes of the experience after every stage.
- Allow participants to brainstorm and work from their tables or stand up in front of the knowledge wall.
- Ensure freedom to go through the processes in a way that makes them feel comfortable. Allow them to build on the process.
- Encourage participants to find out if something can be done differently but achieve the same or better results.
- Remember to write down new or unexpected things that come up as part of your notes in the introspection form.
- Language can nurture collaboration. Use words such as “we”, “us”, “together”.
- Body language should be open and confident, inviting participants to feel at ease and encouraging them to participate.
- Use a power stance, hand gestures to explain, and a clear voice. People remember more and understand better when you use gestures. Avoid fidgeting, hopping, pacing, preening and any blocking gesture such as crossing your arms.
- Use a common language. Remember to explain concepts and acronyms.
- Do not assume people know what you do.

2.3 Toolbox overview

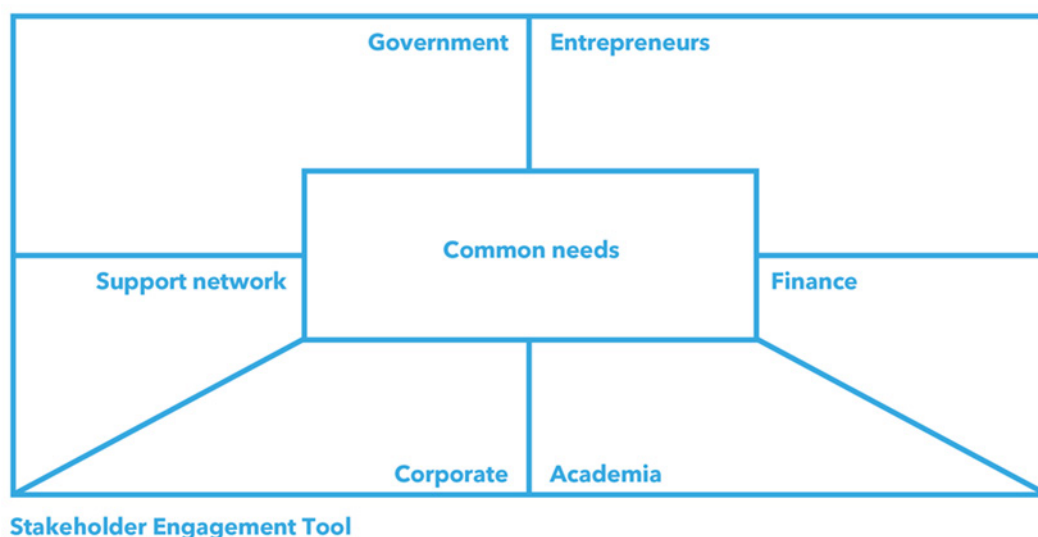
This section presents five tools: the (a) Stakeholder Engagement Tool; (b) Ecosystem Assessment Canvas; (c) Ecosystem Maturity Map; (d) Service Design Tool and (e) Storytelling Canvas.

These tools will help to develop a strong and competitive ICT-centric ecosystem. ITU has developed these tools by conducting innovation ecosystem studies in multiple countries over many years (the ecosystem assessment canvas and the ecosystem maturity map were introduced in the previous toolkit). Additional tools and information to aid the workshop facilitator(s) can be found in the appendices.

2.3.1 Stakeholder Engagement Tool

To be able to find practical solutions to problems, there needs to be an empathetic understanding of stakeholder experience. The Stakeholder Engagement Tool helps to create empathy among ecosystem stakeholders through an understanding of the needs they have in common. Misunderstandings of other stakeholder needs and opportunities contribute to work in silos that inhibits digital transformation. This exercise simply asks each stakeholder what they require of other stakeholders and helps find commonalities.

Figure 13: Stakeholder Engagement Tool Canvas



Source: ITU

Table 4: Key pillars for the Stakeholder Engagement Tool

Entrepreneurs	Entrepreneurs generally need access to resources, networks and favourable policies at every stage of the entrepreneurial lifecycle. They need cash, grants, favourable loans, contacts, help defining their solutions, and access to corporations and decision-makers. They also need excellent programmes in academia or specialized schools to provide them with skills, access to cutting-edge labs and data.
Government	Governments generally need to provide services, reduce bureaucracy and fight corruption. They need to create better infrastructure, strong research and development, and more success stories; increase tax revenues; reduce the grey market and attract investment. Governments must fulfil their end of the social contract.

Finance	The needs can be different depending on the specific stakeholder. For example, investors need tax incentives; stable laws; and fast, cheap and reliable legal procedures. Central banks need to reduce systemic risk and create favourable macro conditions. Venture capitalists need a good portfolio of start-ups, favourable regulation and exit strategies such as a strong stock market, private equity or corporate buyers.
Academia	Academia's needs include conducting effective basic and applied research, offering industry-aligned skills; access to academic, corporate and entrepreneur networks to commercialize research and deliver evidence-based pedagogy; incentives and favourable conditions for teaching and research.
Private sector	Companies and corporations need access to advanced technological research, sensible ICT policies, clear regulations, new business models and markets, increased sales, and cost-saving and automation measures.
Support networks	Support network needs include funding for activities, increased deal flow, good programmes for the ecosystem, and access to other ecosystems and success stories.
Common need	This pillar refers to needs shared by all stakeholders. Typically, they include access to resources, networks, programmes, policies, communities and champions. The common need mirrors many ingredients that the central pillar of the Ecosystem Canvas needs to provide to make an ecosystem vibrant.

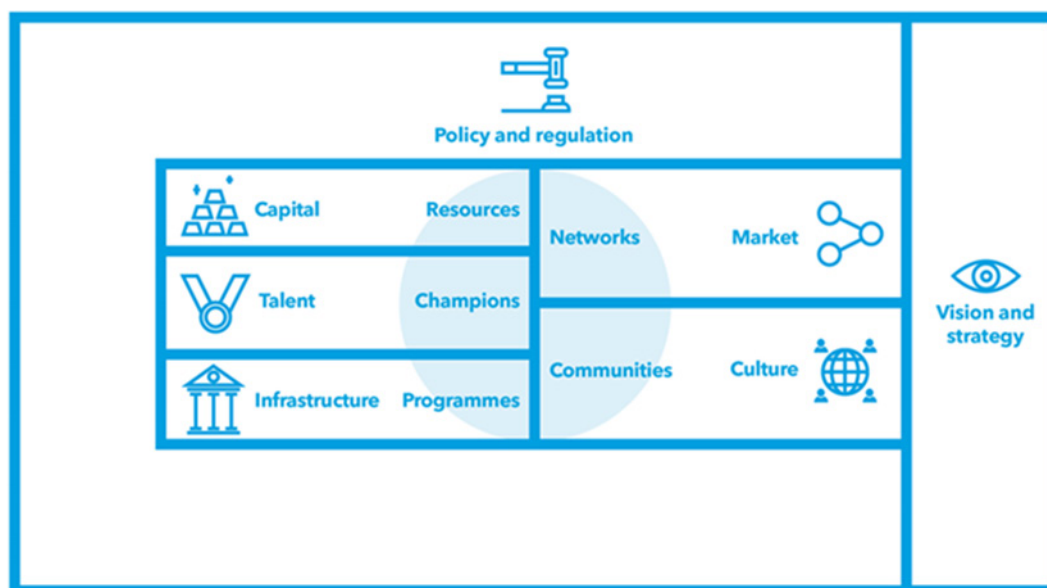
2.3.2 Ecosystem Assessment Canvas

This tool helps to identify and analyse the enablers in the ecosystem that unlock the critical resources to allow digital transformation. The lack of a nurturing environment is a significant challenge to achieving this. By understanding and assessing the ecosystem, the enablers needed to achieve the vision can be identified. Enablers can be programmes, policies and initiatives that are in place to foster digital transformation in the economy.

Since each pillar is one part of a whole, and the function of each pillar is needed for successful innovation activities, the combined efficiency of the pillars can be taken together to indicate a sense of the overall ecosystem efficiency.

The exercise involves brainstorming on each pillar based on its definition. Participants can brainstorm on the current state or a future state. This canvas can also be used to generate a manifesto for the ecosystem.

Figure 14: Ecosystem Assessment Canvas



Source: ITU

The following describes the key pillars for the Ecosystem Assessment Canvas.

Vision and strategy: Identifying the current and future state of the ecosystem is a critical component of the country review. This is because creating a shared vision helps all ecosystem players to rally around a common goal. Setting forth an accompanying strategy helps stakeholders understand their roles and the roles of others, as well as how their activities support the common vision. These are often laid out in government reports, but the ecosystem vision can also come from other sources, such as the private sector or academic networks. It is critical that it is exhaustive and inclusive of all stakeholder input across sectors.

Infrastructure and programmes: These are the building blocks of an innovation ecosystem. Infrastructure is often categorized as hard or soft. Hard infrastructure includes connectivity, roads, electricity and public transportation. Soft infrastructure refers to sharing-knowledge mechanisms and bodies such as tech hubs, training resources and research institutions. Programmes should take advantage of this, especially soft infrastructure, to support the ecosystem.

Talent and champions: Talent refers to the human capital that powers the ecosystem and the resources that enhance that capital. This includes hard skills such as engineering and programming, as well as soft skills such as management, communications, and administration. In addition to a broad talent pool, every ecosystem needs champions to thrive. A champion is a person who plays a leadership role in the ecosystem by initiating change, building cornerstone institutions, and encouraging the contributions of new actors.

Capital and resources: Start-ups need capital to grow and thrive. In the early stages, risk capital, such as from angel investors, is required. As companies mature and expand, funding from larger investors such as venture capitalists and private equity funds can help drive growth. Some of this can come from the government or civil society, but the majority should come from private investors. To complement the work of directly financing start-ups, support networks and other ecosystem-building programmes need resources to operate successfully.

Markets and networks: Start-ups require markets to serve, which is why it is essential to understand the depth of the market and access it locally, regionally and internationally. Additionally, the government is often a significant purchaser of products and services, as well as a source of contracts for budding enterprises. As a result, an efficient and transparent public procurement process is useful

for start-ups. Networks and clusters are also crucial to ecosystems to ensure that innovators have access to all the resources and connections they need.

Culture and communities: Cultivating an innovative, entrepreneurial culture involves sharing fundamental values such as risk-taking, an appreciation for failure, and a willingness to iterate and learn. These values create a blueprint for behaviour across the ecosystem, shared by communities of innovators and champions through events and activities.

Policy and regulation: Supportive policies and regulations can provide fertile ground for the efforts of entrepreneurs and innovators, while poorly developed policies can stifle innovation. Many areas of policy and regulation— including taxation, trade policy, intellectual property law, financial regulation and business regulation— are critical to the success of the innovation ecosystem

Central pillar: There is a central space between the other pillars. This space encompasses activities specifically focused on advancing the work of stakeholders in the ecosystem, such as communities sharing entrepreneurial culture, rather than broad actions that support the economy, such as influencing national culture.

Table 5 highlights the ideal state for each pillar and serves as the basis of the brainstorming and qualitative interviews.

Table 5: The ideal state for each pillar

Pillar	Definition
Vision and strategy	<ul style="list-style-type: none"> • Need for a shared vision • Agreement on issues • Ecosystem working together • Support of a shared vision
Infrastructure and programmes	<ul style="list-style-type: none"> • Hard infrastructure • Soft infrastructure • Distribution • Competitiveness and clusters • Programs to support innovators
Talent and champions	<ul style="list-style-type: none"> • Technical skills • Soft skills • Skills moving to innovation • Champions leading and being recognized
Capital and resources	<ul style="list-style-type: none"> • Availability of investment • Research resources • Possibility of trade and foreign investment • Government and international funding • Resources to build ecosystem supports
Market and networks	<ul style="list-style-type: none"> • Domestic markets • Ability to export • Innovation networks • Formal associations • Ecosystem mapping and collaborations • Informal networks

Pillar	Definition
Culture and communities	<ul style="list-style-type: none"> • Attitudes toward risk and entrepreneurship • Communities and events • Spread of entrepreneurial culture • Diversity and equality in the ecosystem
Policy and regulation	<ul style="list-style-type: none"> • Public sector engagement with innovation • Public sector connections to ecosystem • IP and R&D • ICTs • SMEs • Trade • Finance

2.3.3 Ecosystem Maturity Map

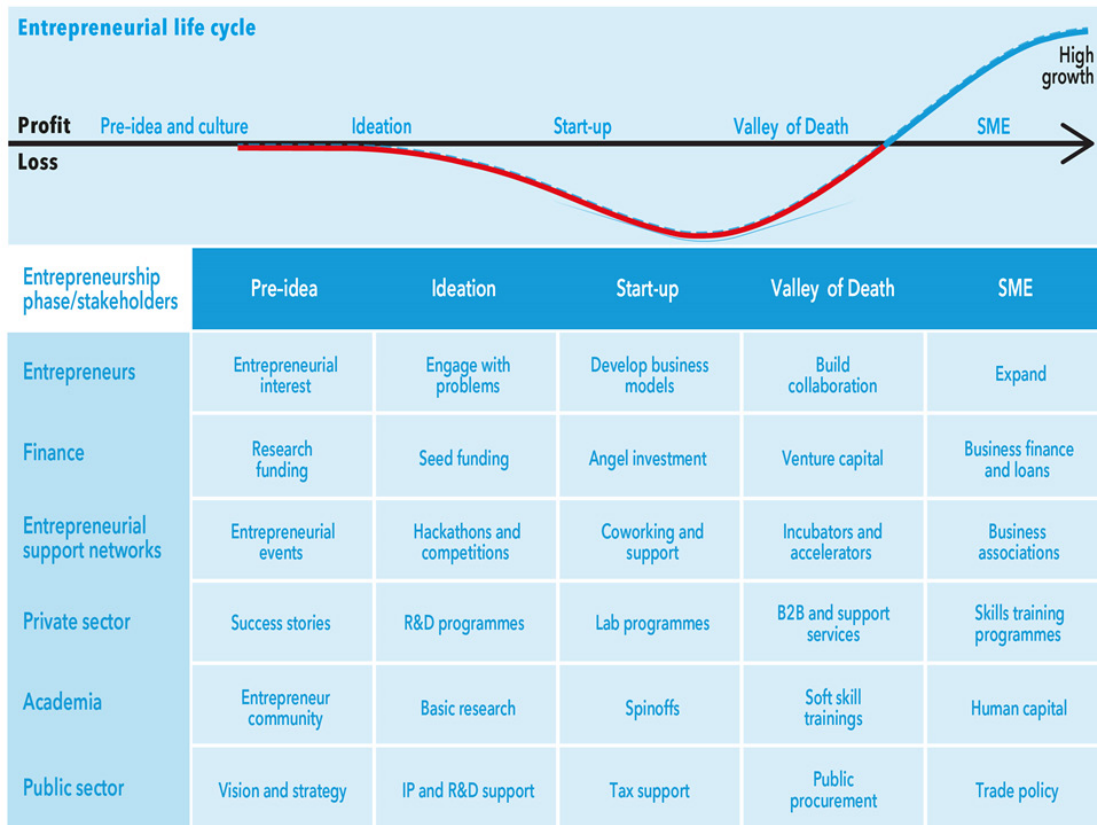
The Ecosystem Maturity Map (also called the Stakeholder Interface Canvas), which is adapted from the entrepreneurial ecosystem lifecycle, helps to map out the roles and actions of stakeholders at each stage of the start-up lifecycle. The lifecycle curve outlines each step in the entrepreneurial journey, emphasizing the gap between the development of a new concept and the moment that it becomes profitable, which is where many ICT-centric innovations fail.

Most support work in the innovation ecosystem is focused on innovators and entrepreneurs, so the Ecosystem Maturity Map also highlights which key stakeholder inputs are needed to promote ICT-centric innovation at each stage. In addition to highlighting the work of individual stakeholder groups, the map matrix illustrates how different actors interact with one another to support the work of innovators and entrepreneurs.

The Ecosystem Maturity Map helps to analyse and understand which specific actions are needed from each stakeholder to support the entrepreneurial journey especially important when they go through the valley of death.

This tool uses stakeholder interviews (through a survey questionnaire) to colour-code each micro job. For example, red can be used to indicate insufficient activities and green can denote more than adequate activities. This can be done in a co-creation workshop or offline as a survey using the qualitative survey questionnaire.

Figure 15: Ecosystem Maturity Map Canvas



Source: ITU

The activities associated with each phase of the innovation lifecycle are described briefly below:

Pre-idea: In this stage, key actors plant the seeds of support in the innovation ecosystem. The public sector provides an overarching vision that other stakeholders can embrace. Entrepreneurs begin exploring innovation while entrepreneurial support institutions cultivate their interest by fostering an entrepreneurial culture and hosting gatherings. Academia also nurtures this culture by providing an environment for young entrepreneurs to test their ideas. Meanwhile, funding ensures the ability to conduct basic research and prototyping, which eventually leads to successful entrepreneurs that inspire, mentor and fund new entrepreneurs.

Ideation: Innovations are developed but have not yet been incorporated as businesses at this stage. Again, the public sector ideally creates a policy environment that encourages research and defends intellectual property rights. Support institutions host idea generation activities, such as hackathons, to help entrepreneurs identify real problems that need to be solved. Academia contributes by producing research that identifies critical needs. Entrepreneurs then begin to engage with these problems and develop solutions they can commercialize. Investors deploy small amounts of risk capital to support these entrepreneurs, while the private sector initially acts alongside them, experimenting with innovation and potentially disrupting their internal business models.

Start-up: In this stage, innovations evolve from concepts into businesses. Entrepreneurs begin to develop business models and seek additional funding from early-stage investors such as angel networks to help their businesses grow. Entrepreneurial support institutions such as co-working spaces give entrepreneurs access to the community, human capital and infrastructure to run their ventures. As entrepreneurs seek customers, a transparent and efficient public procurement system helps them to land contracts. Alongside this activity, large companies launch internal accelerators to insource innovations developed by start-ups, while academia supports the commercialization of basic research by entrepreneurs.

Valley of death: During this challenging stage of development, entrepreneurs need strong support to survive. As such, entrepreneurs will collaborate and share knowledge while venture capital funds provide financing to help start-ups progress from potential to profitable. To reduce operational costs, start-ups can purchase B2B services at a discounted rate from large market-leading companies. Supportive tax policies can also reduce the start-up tax burden. Some start-ups will enter accelerators where they will gain access to mentorship, investors and other promising start-ups. During this stage, entrepreneurs’ business skills (acquired through education or training) become critical.

SME: The velocity of start-up growth increases as they expand rapidly into established businesses, reach steady-state, or exit through buy-outs or IPOs. Finding skilled human capital will become a more significant constraint as start-ups grow. As a result, they will depend on the private sector to provide training programmes and on academia to produce employment-ready graduates. Maturing start-ups will present less risk, giving them access to more traditional sources of financing such as loans and private equity. Ideally, start-ups will continue to expand and eventually return value to investors through an acquisition, buy-out or IPO. This growth will be supported by access to international markets and investors. Start-ups will also continue to receive support from community groups such as business associations that represent their interests.

The following table offers key insights on the questions to be answered while using this tool.

Table 6: Related questionnaire for Stakeholder Engagement tool or Innovation Journey Map

Stages	Pre-idea	Ideation	Start-up	Valley of death	SME
Entrepreneurs	Is there an interest in becoming an entrepreneur?	Are innovators discovering relevant problems to work on?	Do entrepreneurs have the skills they need to develop strong business models?	Do entrepreneurs support one another in the ecosystem?	Are start-ups able to expand into high growth SMEs through buy-out, or IPOs?
Finance	Is funding available for innovators to conduct research?	Is there funding for early-stage ideas to develop into start-ups?	Is high-risk investment available for early-phase entrepreneurs and innovators?	Can start-ups with established growth potential access capital to grow?	Are SMEs able to gain support through traditional investment and loans?
Entrepreneurial Support	Are there events that gather, connect and inspire innovators?	Can innovators join events to validate and develop their ideas?	Are there programmes for innovators to work together, and access resources and knowledge?	Are there programmes in place to support, guide and scale start-ups?	Are there associations or chambers that advocate for and support businesses?
Private sector	Are successful entrepreneurs known to and working with innovators?	Are private firms engaging in or funding research to support innovation?	Are there programmes to support innovators inside and outside firms?	Does the private sector provide services and support to develop businesses?	Are there efforts from the private sector to ensure that needed skills are available?

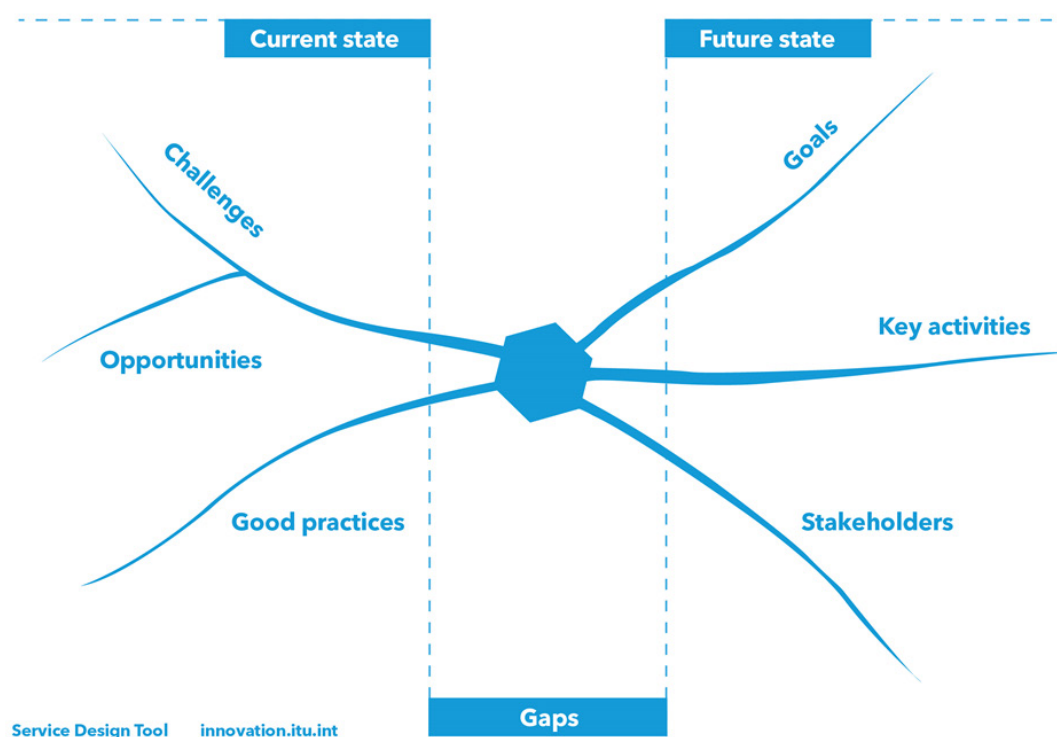
Stages	Pre-idea	Ideation	Start-up	Valley of death	SME
Academia	Are universities providing a nurturing environment and community to inspire entrepreneurs?	Is basic research being carried out and leading to practical innovation?	Does a framework exist to support start-ups based on basic research?	Do universities offer training in the business skills needed by innovators to create start-ups?	Are graduates leaving universities with the skills needed by innovative businesses?
Public sector	Is the government providing and implementing a clear strategy and vision?	Is enough being done to support research and protect intellectual property?	Are there provisions and exemptions in the tax code to support entrepreneurship?	Are public services supporting innovation without distorting markets?	Are there policies to support investment in and trade by innovative businesses?

2.3.4 Service Design Tool

The strategic design of a project scope, comprised of many pillars, is critical to meet all requirements and eliminate constraints. This, however, becomes complicated for innovation projects, since innovation itself is a system issue — the whole process depends heavily on methodological and analytical approaches to solve gaps identified in the ecosystem. Use of the Service Design Tool should be preceded by two other tools: the Ecosystem Assessment Canvas, and the Ecosystem Maturity Map. Unverified decisions or assumptions made during the design of a particular project can lead to an ineffective outcome. To develop a project that is bankable, ITU has created the Service Design Tool to encompass all relevant information and best practices in the design process.

The Service Design Tool is a mind map that collects and categorizes all the important elements of a flagship project. This information can later be reassembled in a way that is attractive to and influential for others. This tool has three sections (current state, future state, gap) and six pillars (good practice, opportunities, challenges, key activities, stakeholders and goals).

Figure 16: Service Design Tool Canvas



Source: ITU

The following describes the key pillars for the Service Design Tool.

Challenges: A challenge is a roadblock that prevents actions from being completed or goals from being achieved. Challenges can exist due to constraints in elements such as skills, time, resources, language and culture.

Opportunities: An opportunity offers the possibility to achieve a goal or complete an action. Through a desirable opportunity, stakeholders can devise a strategy to implement their ideas or practices to achieve their goal(s). Sometimes, a challenge can even be “flipped” into an opportunity.

Goals: Goals refer to specific stakeholder objectives and the desired outcome of the service or initiative.

Good practice: Good practice is comprised of proven methods or techniques that have been generally accepted as superior to alternatives that yield evidence-based impact and successful results, and that can be scaled-up and replicated. Good practices are needed to help develop flagship projects, comparatively assess the strengths and weaknesses of a practice in place, and undertake evidence-based policy or programme development.

Gaps: Gaps are missing elements that are required to reach a future state of a project. These can be essential capabilities, key activities, practices or resources.

Stakeholders: Stakeholders share specific interests or concerns in a service or initiative. Their collaboration ensures a collective approach to the challenges, opportunities, goals, good practice, and gaps relevant to their respective sectors.

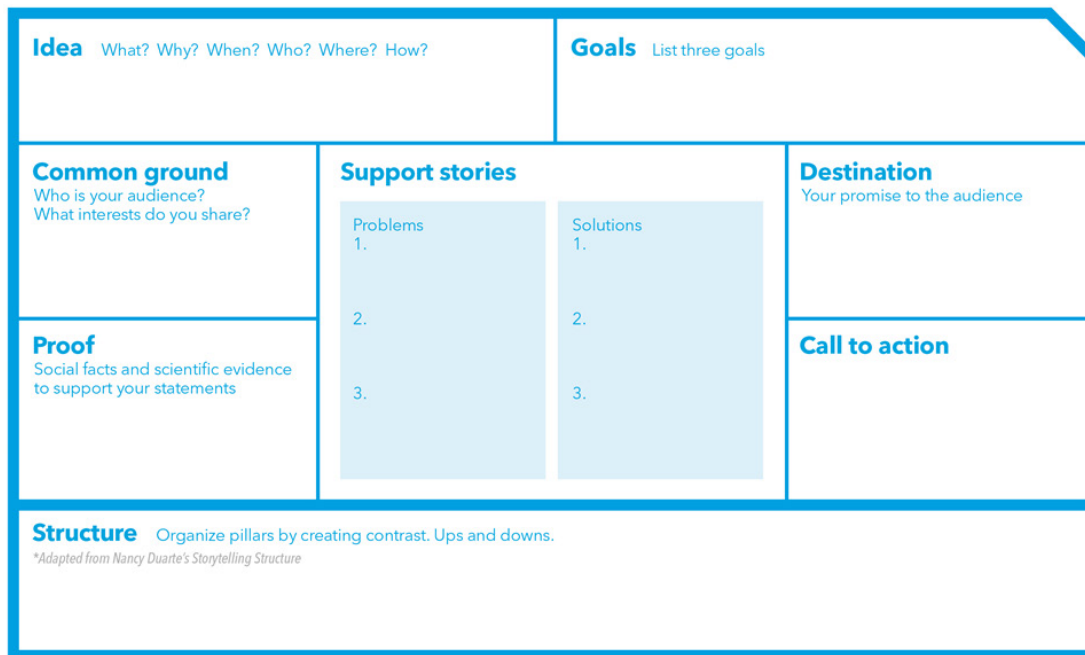
2.3.5 Storytelling Canvas

Stories are the oldest means of communication and are part of our daily lives. Oral communication, a form of storytelling, is the most effective tool to convince an audience. There is no better way to connect with each other than through a story. Through its simplicity, storytelling communicates the essence of a complex idea. Great storytellers use the same techniques to deliver their message, whether in theatre, speeches or presentations.

With the right storytelling framework, any outcome can be communicated, complex ideas can be transformed into simple ideas and projects can be more effectively presented. The Storytelling Canvas can help to achieve a higher level of engagement and empathic communication with the audience, and it will help to build a repository of success stories.

The canvas creates ideas by brainstorming for each pillar, with the exception of the structure pillar. First, complex information is broken down into the idea, goals, common ground, support stories, destination and call-to-action. This information can be fresh brainstorming or ideas carried over from the use of other tools. This revised information is then structured to create a compelling narrative.

Figure 17: Storytelling Canvas



Source: ITU

When telling a story, there are indispensable building blocks to take into account. The canvas presents eight pillars:

Idea: The idea needs to be a simple and concise explanation of what is to be achieved. It briefly touches on why, when, where and how to achieve it. This explanation should be limited to no more than 50 words using simple and shared language.

Goals: Identify the top three goals for the realization of the idea.

Common ground: This pillar identifies interests, opinions, benefits and disadvantages of the audience that will help to bridge divisions and support the message.

Support stories: Support narratives highlight the problems and solutions that will lead to desired goals. Problems are the challenges faced while trying to reach your goal. Solutions are opportunities leveraged to address those challenges.

Proof: Proof can range from social facts to scientific evidence. Proof should portray the challenges and opportunities previously identified, as well as good practices to strengthen the story. They should also provide evidence to strengthen the depth of the narrative. Social and scientific facts help to reinforce the core message of the story because they make it easier for listeners to trust the narrative.

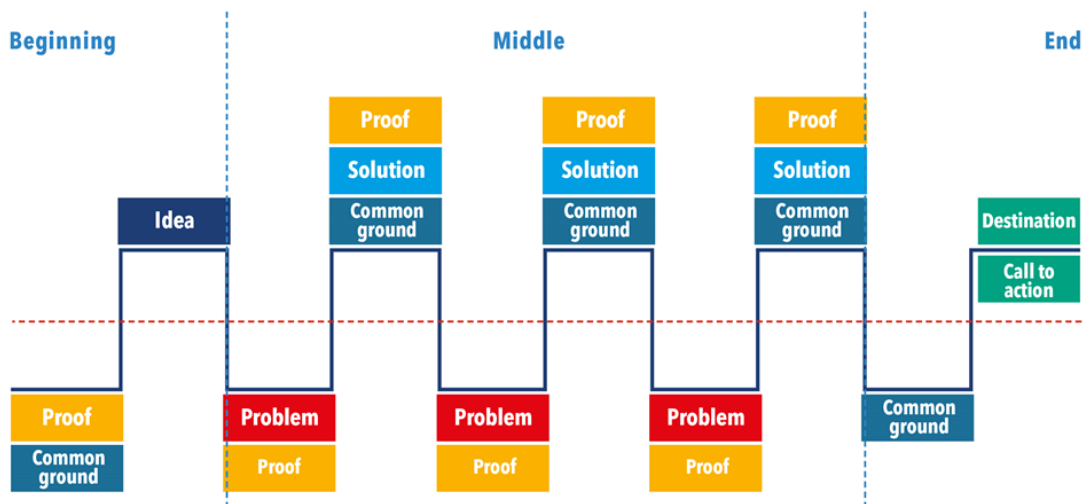
Destination: The destination is the promise made to the audience. It gives a picture of what the future will look like when the idea is realized.

Call to action: In one sentence, the call to action should motivate and inspire the audience to embrace the idea and to join the transformation journey.

Structure: Structure helps to organize outcomes for the seven previous pillars. It creates contrasts and develops a meaningful storyline. Good stories have ups and downs that will take the audience on a journey.

Figure 18: Nancy Duarte persuasive story pattern

Structure | Organize pillars by creating contrast. "Ups & Downs"
**Adapted from Nancy Duarte's Storytelling Structure*



Source: Nancy Duarte

3 Ecosystem initiative case studies

This section provides two ecosystem case studies. These cases can be replicated for a region, city, community or organization, as the methodology provided in this section is flexible.

3.1 Country-level digital innovation profile assessment

Case 1 highlights a request by a country to help strengthen its ICT industry competitiveness and support the development of its digital economy through leveraging ICT-centric innovation ecosystems.

Case 1: Country A context

Country A is an upper-middle income country with an open economy and a large inflow of FDI. Its GDP relies mainly on services with particular focus on tourism. The average GDP growth was around 4 per cent in 2018. Other sectors, such as energy, manufacturing, telecommunication/ICT and agriculture offer untapped potential, while the service sector, currently representing 70 per cent of GDP is at risk of losing competitiveness due to global players leveraging the changing technological environment.

In 2018, the Global Innovation Index positioned country A in the middle of the rankings. The country is not an innovation achiever. It spends less than 1 per cent of its GDP on R&D, and thus may not have access to the benefits of investing in cutting-edge innovation.

The Global Entrepreneurship Index ranks the country in the lower second quartile. It has a small ecosystem focusing on limited opportunities in the country and some outsourcing opportunities. The overall unemployment rate is 20 per cent, while almost one in three young graduates is unemployed.

Most ICT companies are small and have limited value chain integration to other sectors. As a result, the ICT industry stands on its own. The major players are telecommunication companies who run very traditional business models. The majority of households have Internet access, primarily from older technologies, but renewed effort is underway to bring high-speed broadband connectivity. As a result, it ranks in the lower second quartile of the ITU ICT Development Index.

The main barriers for the growth and development of MSMEs include limited access to financing, low awareness of the potential of digital transformation, limited investment in R&D, the extent and cost of administrative bureaucracy and little support from stakeholders.

While country A is currently doing well, it is at a crossroads as the impact of technology and global competition in services is accelerating with implications for its future. As a result, its strongest sectors are facing many challenges.

Box 18: Insights on initial scoping for Country A

The background research on stakeholder groups and basic statistics for the country was compiled before the first visit. Stakeholders were then contacted to schedule qualitative interviews to gather in-depth knowledge about the ecosystem.

Individual interviews led to many ad-hoc interviews with new stakeholders who had not been identified on the original list. Some interviews did not follow a full script of the qualitative questionnaire, requiring some flexibility on the part of the interviewer(s).

During the interview process, many documents, initiatives and programmes were identified to augment knowledge about the three ecosystems (national innovation ecosystem, entrepreneurial ecosystem and technology ecosystem) in its current state.

Case 1: Ecosystem assessment

A stakeholder assessment summary of each ecosystem assessment canvas pillar offers a useful overview of the state of the ecosystem:

Vision and strategy: Innovation in general, and ICT innovation in particular, is a new goal for Country A. In line with regional strategic direction, the country has increasingly recognized the need to build the knowledge and skills for an interconnected innovation ecosystem and a supporting infrastructure that boosts productivity, production base and competitive advantage. While the country has some strategies for development through achieving three strategic goals (increase innovation capacity, strengthen instruments of collaboration between actors and strengthen potential for innovation in business sector), implementation is slow and many enablers are missing. There is a clear need to improve administrative capacity, access to funding and general coordination. Institutional fragmentation, duplication and a lack of coordination across strategy implementation are slowing progress on digital innovation in general.

Infrastructure and programmes: Basic infrastructure is still under development. Government and private sector investment have helped develop ICT infrastructure and connectivity, and broadband and mobile connectivity are available; but access and affordability need improvement, particularly in rural areas. The government and some private sector companies have championed soft infrastructure development, but this is insufficient across the country. Most initiatives are not coordinated among actors to create proper ecosystem density and linkages. This infrastructure also lacks programmes that focus on the core potential of its digital economy.

Talent and champions: There have been recent improvements in the formal education system to develop IT talent. There are missed opportunities in secondary education, where IT is only mandatory in the early years. There is a mismatch between the number of ICT graduates and the number of ICT sector employees, which points to underused potential in the industry, and thus growth potential. As a result, the country is losing its talent to regional neighbours. A lack of soft skills and low levels of English proficiency are also holding entrepreneurs back. Several programmes have been introduced to support innovation, but their impact is yet to be enjoyed.

Capital and resources: Accessing finance is a long-standing challenge for companies in Country A. Although credit lines and factoring facilities exist for SMEs, interest rates both in the traditional banking system and in microfinance lending generally remain high. Unfortunately, critically important risk capital (business angels, venture capital, revenue-based financing and crowd funding), which seeds start-up initial stages, is mostly absent. While some venture capital funds are active in the region, they have no physical presence in Country A. Most entrepreneurs secure early-stage investment in business incubators and accelerators outside of the country where they register their businesses. Access to capital is difficult and as a result, start-ups are looking elsewhere for support.

Market and networks: The small domestic market and the absence of public procurement initiatives for innovative solutions result in insufficient demand for innovators' work. In addition, innovative efforts in general address established and strong industry sectors, which are not well represented in the region. Companies in Country A, as with other countries in the region, are much less integrated in global value chains, limiting their access to innovation-related knowledge and market opportunities. Some business associations and clusters are now fostering collaboration and geographical inclusion. In fact, the country is regionally well connected through formal networks at public-sector and private-sector levels. In spite of this, the majority of MSME innovation activities focus on internal business processes, while very few create innovative products or services based on new technologies.

Culture and communities: SMEs are less than open to the idea that business models and methods continue to evolve, and that their corporate strategies need to change accordingly. Rigid focus on core business prevents such businesses from seeing new, sustainable and long-term markets. Although risk-taking is inevitably part of the start-up culture, SMEs tend to be risk averse. This is unattractive to talent and hinders innovation and entrepreneurship. There is a lack of leadership and

ownership in the system. Lack of trust prevents information sharing and knowledge exchange across organizational borders, while insufficient cooperation between enterprises and scientific institutions limits progress in innovation. In contrast, the small entrepreneurial community is very open and inclusive. A small number of organizations and digital business champions are active in mobilizing the start-up community, but there is a need to develop a mentor network to kick-start innovative business development.

Policy and regulation: Policies that support innovation touch on a number of areas, including education, research, the economy and the information society. There is no central body responsible for the coordination and oversight of the innovation ecosystem. Various ministries share responsibility for regulation and implementation laid out in the innovation strategy. Except for specific e-services related to government, there are no action plans or organizational units to address the broader development of the information society. For broader innovation-related matters, there are several strategies and government-related bodies, resulting in a lack of clarity when implementing policy. There is a need to embed innovation in policy-making to ensure that its impact is fully assessed. In addition, public-private consultation needs to be strengthened; consequently, policy ultimately aims to develop a competitive private sector.

Box 19: Insight on ecosystem maturity

After thorough consultation through stakeholder interviews, a preliminary assessment of each pillar was developed and shared in a stakeholder workshop to receive feedback from the community. This was the first workshop held with all stakeholders and enabled additional input for the profile development.

Additionally, during this workshop, stakeholders were presented with an interactive exercise to develop the Ecosystem Maturity Map using the tool shared earlier. Through facilitated discussion and information sharing, the workshop helped capture a common agreement on what it feels like to be an innovator in this ecosystem.

The Ecosystem Maturity Map, also known as the Innovation Journey Map, sets out the work that needs to be done within the ecosystem to harness innovation on a transformative journey from pre-ideation to high growth. It describes stakeholder roles in support of entrepreneurs and innovators at each stage of the lifecycle. The Ecosystem Maturity Map colour-coding system identifies areas which are well-supported (green), inadequate (yellow) and missing/weak (red).

Figure 19: Case 1 Ecosystem Maturity Map

Entrepreneurship phase/stakeholders	Pre-idea	Ideation	Start-up	The "Valley of Death"	SME
Entrepreneurs	Entrepreneurial interest	Engage with problems	Develop business models	Build collaboration	Expand
Finance	Research funding	Seed funding	Angel investment	Venture capital	Business finance and loans
Entrepreneurial support networks	Entrepreneurial events	Hackathons and competitions	Coworking and support	Incubators and accelerators	Business associations
Private sector	Success stories	R&D programmes	Lab programmes	B2B and support services	Skills training programmes
Academia	Entrepreneur community	Basic research	Spinoffs	Soft skill trainings	Human capital
Public sector	Vision and strategy	IP and R&D support	Tax support	Public procurement	Trade policy

Source: ITU

Case 1: Key takeaways

In Country A, the three engines of growth fundamental to the digital transformation journey currently face challenges and opportunities.

National innovation ecosystem: The innovation ecosystem is at an early stage of development despite being the oldest of the three engines of growth. There has been slight progress in R&D capacity, technology transfer, and innovation. Public sector efforts to affect digital transformation are not coordinated or directed at fostering ICT innovation. Research levels are low and too slow to market, applied science is absent and technology transfer inadequate. Stakeholders across the public sector, academia, entrepreneurship, entrepreneurial support networks and finance continue to work in silos and have not woken up to the potential of the ecosystem as a whole.

Entrepreneurial ecosystem: This ecosystem is the most promising among the three engines of growth. ICT entrepreneurs and innovators in the country are talented and motivated but face difficulties as they seek to develop and flourish. The challenges are significant: a shortage of B2B platforms for SMEs, scarce government incentives, limited access to pre-seed and seed funding and commercialization opportunities, regulations that deter entrepreneurs from registering start-ups and public-private partnerships that are inadequately regulated. Restricted access to payment platforms prevents entrepreneurs from selling in international markets. Several incubators, co-working facilities, NGOs and entrepreneurial support networks are providing entrepreneurs and start-ups with the resources to help them start their ventures or scale up.

Technology ecosystem: The latest wave of technology is more challenging for SMEs. There is significant disparity between industry sectors in terms of digital transformation performance. Only a handful of high-tech companies — mainly suppliers to the telecommunication and banking industry — are on the market. Businesses are not taking full advantage of advanced technologies (e.g. cloud, big data, blockchain, AI, IoT, 3D printing, machine learning, robots and drones); while government is slow to design policies that support innovative and collaborative business models. The research infrastructure is outdated, with very few laboratory and research institutes meeting regional standards and limited financial investment in research. Private sector companies do not use these laboratories for their research. This is compounded by low motivation to invest in technical skills and training: such investment is viewed as merely a compliance requirement. These challenges, combined with low

incentives to develop and export IT products and services, and an absence of favourable tax policies, negatively affect potential for technological innovation.

Box 20: Insights from the three engines of growth

After collecting full qualitative data and hosting a stakeholder workshop, all data were reviewed using the engines-of-growth lens to assess what is preventing ideas from scaling. Using a simple Venn diagram of the basic information and the Stakeholder Engagement Canvas, enabled a parsing of the data for relevant information analysis. Combining the insights from the workshop and desktop research gives an accurate snapshot and diagnosis about the ecosystem.

From this understanding, brainstorming for root causes (systemic, talent or resource issues) will ensure coherent recommendations for the next steps. Recommendations for any ICT-centric ecosystem diagnosis must address issues that cut across all three engines. Without this, project development will only solve part of the problem and be limited in scope and impact.

Case 1: Next steps

To address the key challenges above and bring the three engines together, the following elements should be addressed in a concrete flagship project, focusing on creating ecosystem density, focus and linkages:

- **Ecosystem governance:** A supportive public sector proactively manages development with all stakeholders.
- **Ecosystem linkages and density:** Nurture start-up and technological entrepreneurship programmes inclusively across all regions.
- **Ecosystem focus:** Foster digital transformation and ICT-centric innovation in focus areas such as tourism, agriculture and energy.

The assessment is complete and the challenges and have been opportunities identified. The process of developing an ecosystem project to establish a sustainable environment for digital transformation in the country can begin.

The next case study will develop a full project.

3.2 Ecosystem flagship project for a country

Case 2 highlights the study of Country B, which seeks to develop a new digital transformation centre to leapfrog digital development into the twenty-first century and requested technical assistance from ITU.

Case 2: Context

Country B is a middle-income country with a strong manufacturing and service sectors, and potential to develop other sectors such as mining, agriculture, tourism and ICT. Its average GDP growth rate was 2.82 per cent between 1994 and 2018. Country B is considered one of the most competitive countries in its region.

Despite significant social progress through making key public services such as education, health, housing and electricity accessible to millions, the country has high levels of unemployment (26.6 per cent in 2018).

The Global Innovation Index positioned Country B in the middle of the rankings. The GEI and ITU IDI rank it similarly. Thus, the performance of each of engine of growth is not in line with its regional leadership status.

The country has consistently imported more ICT products than it has exported. Affordable and accessible high-speed broadband is an important enabler for competitiveness across many areas; while the government has made gradual efforts towards further infrastructure investment and development, which is needed to meet market demand.

SMEs contribute to 32 per cent of GDP, 59 per cent of employment and 19 per cent of exports. While small businesses and entrepreneurs face barriers such as bureaucratic procedures and licensing, efforts are being made to provide financial and non-financial assistance through national and sub-national support programmes; some of which target sub-groups such as youth or previously disadvantaged groups.

The sectors with the highest potential for employment and inclusion contribute less than 9 per cent to the GDP, leaving many opportunities unexplored. In the meantime, the driving sectors (manufacturing, financial and automotive) are under increasing pressure with the digital transformation of value chains in the digital economy.

Box 21: Insights into the general ecosystem of Case 2

Through desktop research, selective stakeholder interviews and workshops, a snapshot of the ecosystem context can be developed. The process itself is iterative and requires several empathy sessions with relevant stakeholders from across the ecosystem groups.

Case 2: Ecosystem assessment

A stakeholder assessment summary of each pillar offers a useful overview of the state of the ecosystem:

Vision and strategy: The country has a strong vision and long-term strategic plans, complemented by robust policies and political will. However, this vision is not shared by all stakeholders and needs to be communicated more clearly. The political will and commitment are not currently being fully translated into implementation, as there are limited mechanisms to nurture stakeholder collaboration. As a result, innovators may not be engaged in addressing relevant problems. Many stakeholders have been working in silos.

Infrastructure and programmes: There is growth in infrastructure, along with high mobile penetration, but there is also a high cost, often due to monopolies. Investment could position the country as a leader in bridging the digital divide. There are particular opportunities in ICT infrastructure, multi-technology space, drones and artificial intelligence, and automation and digitization of processes.

Existing soft infrastructure is limited despite investment from State development agencies. Mentoring, skills training and other soft infrastructure is inadequate. There is a rural-urban divide with respect to resources.

Talent and champions: Talent needs to be developed and equipped with adequate project management, collaboration, mentoring and business skills. There are public policies to upskill talent, but efforts fall short of ecosystem needs. Existing initiatives are insufficient to enable talent to leverage opportunities and create synergies with the private sector. In addition, the ecosystem struggles to retain talent due to limited championing, success stories and opportunities. There is in particular a lack of knowledge of the most recent technologies and deep skills. Thus, talent is at a crossroads.

Capital and resources: There is capital for innovation, but it is currently insufficient to drive innovation to market. There is particularly high demand for risk capital (especially for high-tech ideas) but the

financial sector has little appetite for unproven ideas. There is a need to develop venture capital and to nurture alternative forms of funding. The private sector is failing to take an active role in creating demand investment to meet this gap, especially in the technology sector. Country B is an attractive investment destination, so more needs to be done to unlock this potential. This includes improving the flexibility of legislation and developing the appropriate policies and incentives to finance innovative ICT infrastructure that can support key sectors, allow SMEs to grow and create jobs.

Market and networks: Government programmes have provided some market access for SMEs, but their effects have been slow to create high-growth firms. Many SMEs are unable to be scaled, running into issues with commercial expertise and access to markets. Very few B2B platforms exist to help grow non-technology businesses, and existing start-ups do not have access to the right resources to create such platforms. Market awareness and access is a particular challenge. There are high barriers to entry, compounding the problem for small firms. There are very few success stories of SMEs successfully tapping into domestic or regional markets.

Culture and communities: Country B has seen a growth in entrepreneurial interest driven by needs-based entrepreneurship and various programmes that fund enterprise development. However, the motivation is sometimes misplaced: some entrepreneurs feel entitled to resources yet lack the entrepreneurial drive to solve problems with a real growth mindset. Competition between players in different parts of the ecosystem has led to individualistic approaches to innovation. Without collaboration, knowledge and expertise flow have been significantly inhibited, preventing key innovations to reach market. Efforts for diversity and inclusion are seen as social redress activities instead of business opportunities.

Policy and regulation: There are strong policies aimed at building skills, promoting enterprise development, supporting SMEs and funding basic research. However, the implementation of these policies needs improvement through specific strategies and monitoring. The public sector could improve policies and provide further legislative support in key areas. Policies that focus on building future talent, creating education curricula to reflect most recent technologies, and promote fair and inclusive secure data policies, technology transfer and risk capital formation are insufficient to meet current needs.

In addition, very limited applied research is accessible to the ecosystem. There is a need to ensure that the ideas that receive funding have corresponding programmes and resources to aid commercialization and are protected in order to be competitive.

Figure 20: Case 2 Ecosystem Maturity Map

Entrepreneurship phase/stakeholders	Pre-idea	Ideation	Start-up	The "Valley of Death"	SME
Entrepreneurs	Entrepreneurial interest	Engage with problems	Develop business models	Build collaboration	Expand
Finance	Research funding	Seed funding	Angel investment	Venture capital	Business finance and loans
Entrepreneurial support networks	Entrepreneurial events	Hackathons and competitions	Coworking and support	Incubators and accelerators	Business associations
Private sector	Success stories	R&D programmes	Lab programmes	B2B and support services	Skills training programmes
Academia	Entrepreneur community	Basic research	Spinoffs	Soft skill trainings	Human capital
Public sector	Vision and strategy	IP and R&D support	Tax support	Public procurement	Trade policy

Source: ITU

Box 22: Insights from the current state of Country B

To deliver a project, the ecosystem needs to be understood in its current state. Only then can development of an idea begin. A parallel approach to Case 1 can be undertaken, but this time, rather than beginning with qualitative interviews, basic information was gathered through desktop research and a series of stakeholder workshops. This develops a common language and the current state.

As with Case 1, an Ecosystem Maturity Map was generated using the stakeholder engagement tool in a co-creation workshop. An ecosystem manifesto was also developed with the stakeholders. This process followed the Ecosystem Canvas model by brainstorming the desired state of the ecosystem in three to five years. Its main purpose is to reach a common agreement with the stakeholders for their digital transformation journey.

Case 2: Key takeaways

As in the previous case, the three engines of growth fundamental to the country's digital transformation journey are facing challenges as well as opportunities.

National innovation ecosystem: Research is currently too slow to market, there is a low success rate in tech transfer and an ongoing exodus of foreign exchange. Basic infrastructure (such as transport, electricity, and ICT) is lacking, limiting the extent of innovation in the country. Youth unemployment rates are high, and the large, talented pool of young people lack the appropriate innovation-relevant skills despite numerous public sector programmes and initiatives.

The ecosystem also lacks communication and collaboration and suffers from inclusion and diversity issues.

Entrepreneurial ecosystem: Entrepreneurs and innovators are talented and motivated, but face difficulties in their innovation journey. Entrepreneurs' access to support systems is limited, and there is a shortage of platforms for innovation (especially B2B platforms for SMMEs). Difficult access to the market also impedes entrepreneurship. Moreover, there is not enough hunger for high-growth innovation. Attitudes around innovative thinking need to be developed further. There is opportunity for both private and public engagement to make a positive impact on the entrepreneurial ecosystem. This includes increased venture capitalist and angel investment funding, as well as policies to support them accordingly.

Technology ecosystem: Country B is facing significant challenges in leveraging new technological solutions. As noted previously, there is a monopoly of value chains by some large enterprises that has negatively affected new entrants and entrepreneurs. There is also a lack of motivation for the private sector to invest in skills development and training; activities in these areas are viewed as a compliance requirement. There is an opportunity to review policies and programmes that can nurture the formation of a technology ecosystem from the commercialization of innovation, to the development of appropriate skills and the improvement of public-private partnership.

Case 2: Ecosystem project

At a macro level, there are challenges facing all three individual ecosystems, as well as one they commonly face.

First, there is a general lack of awareness surrounding most recent technologies and the opportunities they can bring. Second, both public and private sector efficiency and focus hinder progress for innovation to scale. Third, insufficient resources and funding is an important challenge. Silos also inhibit progress.

Country B stakeholders used ITU expertise to develop a project to establish a digital transformation centre based on a whole-ecosystem approach and global expertise from international best practices to organically remediate the various challenges and leverage opportunities in untapped sectors.

Six foundational strategies for the centre were developed to strengthen the three engines of growth. Three of these aim to develop an environment conducive to innovation: (a) guide innovation dynamics for policy agility; (b) building innovation capacity to equip innovators with the right tools, skills, space and expertise to succeed; and (c) integrate digital innovation in key sectors of the economy to enhance competitiveness and impact in non-ICT sectors. These strategies build the core of a strong digital innovation engine.

The three remaining strategies are: (d) strengthening linkages in the engines of growth through insight research; (e) knowledge sharing and (f) developing partnerships. The main goal is to provide a space where both domestic and international initiatives can cross-pollinate and find an anchor point to nurture Country B's ecosystem.

The above strategies form a strategic framework for the centre, but a new operational framework is needed to allow agility and accountability to the multiple sectors and stakeholders. Therefore, the centre was equipped with a strong governance model and a unique core framework to leverage synergies from the three engines of growth. This framework will be rooted in strong standard operating processes.

Last but not least, a strong initial roadmap with key flagship initiatives was developed to both target ecosystem density and ecosystem focus, especially around key sectors of interest. The centre will be launched with these initiatives. It will be monitored and enhanced over several years.

Box 23: Project development insights

The key to developing a strategic framework for the centre was to host a co-creation workshop where three pillars were conceptualized to develop the ecosystem and three pillars to mature the ecosystem using the Service Design Tool.

The output from the design of these pillars was then transformed using the Storytelling Canvas to enable clear communication.

The resulting project concept was developed through iterative feedback and additional stakeholder consultations to seed the initiatives for the project.

4. Conclusion

Industrial revolutions have the potential to significantly — both positively and negatively— impact economies. These impacts can be felt in most economies. In most countries, innovators lack twenty-first century skills to leverage new technologies, face difficulties in collaborating with problem owners and resources owners, must contend with inadequate infrastructure which inhibits them from innovating and lack incentive to contribute to the development of their communities.

Building inclusive and globally competitive businesses is a goal for most countries. However, most ecosystems are only capable of developing start-ups to a certain valuation due to the lack of adequate programmes, resources, networks, communities and underpinning policies. Consequently, once a firm reaches a certain level, it will likely migrate to a more favourable ecosystem, taking both talent and opportunities with it. This is the new brain drain, which will have significant impact on communities.

Traditional top-down policy-making is ill equipped to cope with the needs of digital innovation ecosystems. A result, talent is unfulfilled, symptomized by a lack of productivity and growth in businesses. New approaches to digital development are needed to leverage the full potential of a country's economy through digital technologies. There is a need to build vibrant ecosystems to ensure successful navigation of technological revolutions.

To understand the challenges and opportunities of an ecosystem, the first necessary step is to establish a common language. Without this, there will not be a common understanding of the problem. The second step is to use globally comparable lenses to view an ecosystem's problems, which offer a quick way to understand the root cause of an ecosystem health, identify good habits that should be amplified and replace inefficient practices with improved ones.

Too often, the ecosystem leaders are looking for a quick fix that does not address the root causes. They are quick in copying practices from other communities without proper assessment or understanding of its fit; preventing limited resources from solving the most urgent issues. A rich, organic ecosystem has diverse resources, relationships between stakeholders and rules that enable it to evolve. Such ecosystems are not siloed: most stakeholders play a role in fostering the enabling environment, offering innovation capacity and strong linkages so ideas can scale to market. In the absence of a proper ecosystem mix, the ecosystem will not thrive.

Four opportunities outlined in this toolkit should be explored to create thriving ecosystems: (a) governance through leveraging agile organizations, (b) guidance through clear roadmaps and agendas to reinforce the fabric of innovation, (c) capacity through inclusive innovation spaces and programmes, and (d) focus through specifically targeting key sectors to create competitiveness.

There are often initiatives that offer various ingredients needed by stakeholders. However, they tend to be unfocused and compete with one other instead of working together. As a result, new approaches where collaboration, trust and meaningful digital development come together are crucial.

ITU has developed this second toolkit to help you understand and address your community's capacity to nurture innovations at scale. This toolkit provides a renewed understanding on diagnosing and developing sustainable ICT-centric innovation ecosystems. ITU has used these tools in numerous contexts and with a range of stakeholders from Member States to members from academia; to small actors trying to build an ecosystem around nurturing digital innovations.

We share two case studies in this toolkit to demonstrate how one can develop a clear understanding of their environment and develop flagship projects to strengthen it. The first case shows ITU's approach to building a digital innovation profile and offers a snapshot of a country's capacity to innovate. The second case provides similar insights, additionally developing a bankable ecosystem project based on the profile assessment.

A recent report from the UN Broadband Commission notes that global Internet growth has slowed, and that focus must shift to meaningful universal connectivity to drive digital development¹⁵. Without meaningful content, access and use of ICTs will lag behind and communities will not benefit from the digital dividend or digital opportunities. This toolkit offers the insights and tools needed to help unlock digital potential.

¹⁵ <https://www.broadbandcommission.org/publications/Pages/SOB-2019.aspx>

Appendix A: Other information and tools

Stakeholder group examples

Table A1: Recommended representatives for stakeholder groups

Stakeholder group	Recommended representatives
Public sector	The following ministries or government bodies, if they exist, should be identified: tourism, finance, education, IT/ICT, ICT regulatory, stock market regulatory, commerce, agriculture, SME promotion, and science and innovation commissions.
Support network	Key stakeholders are incubators, accelerators, mentor networks, industry associations, ICT chambers of commerce, ICT media organizations, cluster organizations and technology parks.
Private sector	Key stakeholders are telecommunications/ICT companies, established SMEs and associations.
Finance	Key stakeholders are the central bank, traditional banks, non-traditional banks, angel investors, and venture capital and private equity firms.
Entrepreneurs	Key stakeholders will be from each stage of the entrepreneurship lifecycle (e.g. pre-idea, start-up, SME, growth) and will be from different sectors.
Academia	Key institutions are technology related, e.g. vocational schools, along with research and business institutions.

How to conduct desktop research

Reputable sources for desktop research are organizations that produce data on standard indicators or from suggestions made by stakeholders. Secondary sources include local and international statistics, ideally corroborated multiple sources, legislation relevant to pillars; and reports, studies and indices measuring pertinent indicators to a pillar.

Table A2 represents key international data sources for the Ecosystem Canvas pillars. Local sources of data should be used to supplement them, but the sources listed below provide a starting point.

Table A2: International data sources for the pillars of the ecosystem canvas

Data	Relevance	Sources	Usage
ITU World Telecommunication development indicators and reports	Information on internet penetration, ICT usage, ICT skills, ICT specific reports on broadband, inclusions, etc.	ITU web site	General context; pillar analysis
UN broadband reports	Strategies and report on broadband and infrastructure	UN Broadband Commission website ; ITU website	Pillar analysis
World Bank statistics and reports	General macroeconomic statistics for GDP information; specific country studies on various domains; World Development reports	World Bank website; World Development reports ; World Bank statistics	General context; pillar analysis


Data	Relevance	Sources	Usage
Global Competitiveness Report	Country rankings on competitiveness and related information on economic stages based on Porter's model; insight into the drivers of productivity and prosperity	World Economic Forum website	General context; Capital pillar (access to funds); Market (market size)
Global Innovation Index	Ranks innovation performance of countries and economies based on 82 indicators; measures innovation inputs, output and their efficiencies;	WIPO Website ; Global Innovation Index website	General context; Capital pillar (diversity in types of funding)
UNDP Human Development Index	A measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living	UNDP website	Talent pillar
21st century skills	Provides trends on skills development and requirements	WEF skills and employment report	Talent (trends)
Global Entrepreneurship Index	Measures the health of entrepreneurship ecosystems; data on entrepreneurial attitudes, abilities and aspirations vs. social and support infrastructure	Global Entrepreneurship and Development Institute	Capital (risk capital); Culture (risk acceptance, cultural support, opportunity perception, product and process innovation); Market (internationalization, networking, high growth, competition); Infrastructure (technology absorption); Talent (human capital, start-up skills)
Country specific strategies and policies	National ICT strategies; other related strategies supporting various sectors (e.g. agriculture, tourism, etc.)	Country stakeholder insights; country research	General context; pillar analysis; recommendations
Country statistics and surveys	Indicators from national statistics office on various measures, outputs, and surveys	National statistics office	General context; all pillars

The primary output from desktop research and stakeholder mapping is a dossier of basic information on the innovation ecosystem that will inform the next step of the review process.

Qualitative Interviewing Tool

The Qualitative Interviewing Tool is used to gather insights on the strength of each ecosystem pillar by collecting input from stakeholders. This information is meant supplement the desk research and provide a ground-level understanding of the innovation ecosystem. The tool consists of a 40-question survey that focuses on each pillar and takes approximately one hour to complete. The interviewer has the latitude to direct the flow of dialogue and expand where necessary. See Figure A1 below to view a portion of the questionnaire.

Figure A1: Section of the Qualitative Interviewing Tool



Standardized Questionnaire for Country Review Interviews

Pillar	Question
Background and general information	<ol style="list-style-type: none"> 1. Interviewer name 2. Time and date 3. Respondents and organization 4. Tell us about your work 5. What are some of the outcomes you expect from this process?
Strategy and vision	<ol style="list-style-type: none"> 6. What are the main issues in the ICT-centric innovation ecosystem? Do you think the situation is good? Is it improving? 7. Do you think there is a common understanding and consensus on these issues between stakeholders? 8. Is there a clear national strategy for the ecosystem? 9. Are you working under a clear vision, both in your own work and in your role in the ecosystem? 10. Does the work of your organization specifically include efforts to support national strategies?
Infrastructure and programmes	<ol style="list-style-type: none"> 11. How do you see the quality of overall hard infrastructure, especially in terms of communications and technology? 12. Is there access to soft infrastructure? Training programmes, innovation events, knowledge institutions, research activities, facilities for these activities? 13. Can firms access needed equipment and resources? 14. Is there evenly distributed access to soft and hard infrastructure? 15. Is the country competitive regionally and globally? 16. Are champions active in the ecosystem? Can you name some? 17. Do programmes and communities fostering the innovation ecosystem have the resources and funding they need to thrive?

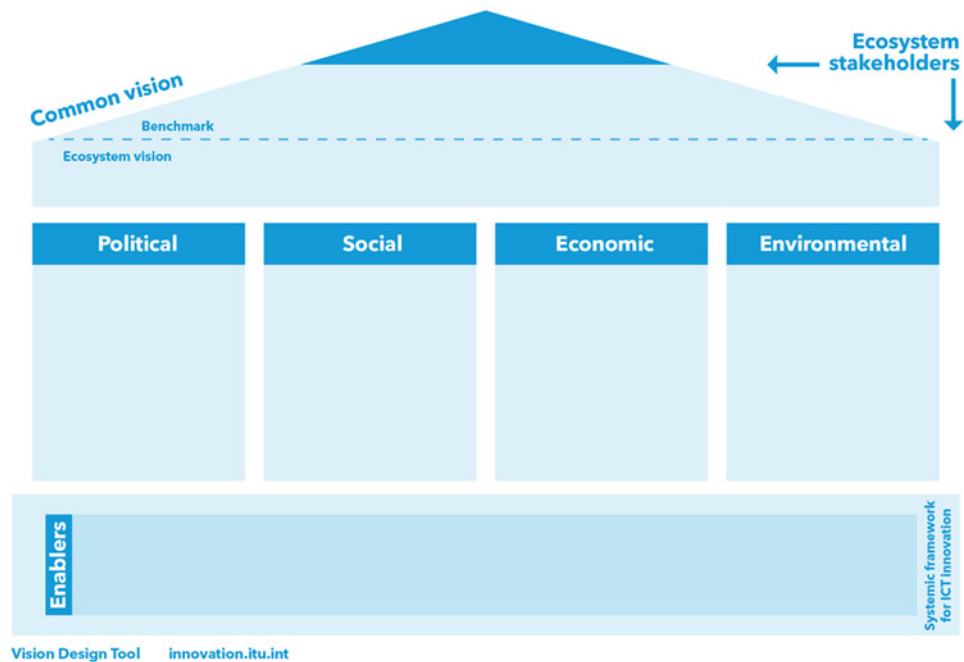
Source: ITU

Vision Design Tool

A clear vision for digital transformation shared at a community or national level results in resources and efforts staying focused on one objective. In this way all stakeholder visions and strategies can be aligned, including those of previously siloed stakeholders, enabling a collective understanding of gaps and opportunities. This alignment will result in being able to create a cohesive common agenda.

The Vision Design Tool helps to define a common understanding by assessing, designing and positioning the ecosystem vision as part of a national strategy, focusing on the four central pillars: political, social, economic and environmental. It also helps to identify enablers and critical players that turn the shared vision into reality. The stakeholders can be actors or individuals in infrastructure and programmes, talent and champions, capital and resources, markets and networks, culture and communities and policy and regulation.

Figure A2: Vision Design Tool Canvas



Source: ITU

The Vision Design Tool is used to develop an overarching community or national vision for digital transformation. It enables alignment of various silos of stakeholders’ visions and strategies, and an understanding of their collective gaps and opportunities to create a cohesive common agenda.

The Vision Design Tool has seven key pillars. These pillars help the user understand stakeholders’ strategies and vision with respect to the common goal of creating an innovation-driven economy. Such an economy offers highly skilled jobs, high-growth industries and world-class export.

Benchmark: Most countries usually have established a benchmark for digital development based on national or international narratives such as the SDGs, smart cities, smart societies and the creative economy. The benchmark pillar is essential to having common language between stakeholders to avoid miscommunication and misleading information.

Ecosystem vision: The overall vision for the ecosystem. Each stakeholder may have their own visions of achieving the benchmark. It is critical to understand if there is a shared vision, or manifesto, for the ecosystem. If not, there needs to be an understanding of each stakeholder’s role in embracing the digital transformation of the ecosystem. These could be transparency, self-governance or collaboration.

Political: Economies usually establish specific strategies to meet some political goals; such as transparency, e-governance, laws and regulations, one-stop services and e-citizens. These drive digital transformation in the public sector or to enable the private sector to have access to efficient public services.

Social: Digital strategies help achieve social goals, such as education and health, that promote inclusion and diversity. Without having digital strategies that focus such issues, many social issues in society will not benefit from technology as they will clear coordinated actions and roadmap to achieve impact.

Economic: Digital strategies have direct economic benefits in key sectors such as agriculture, tourism or any sector vital to employment in a country. It is contextual to a country’s development and competitiveness. Without a specific digital strategy for the competitiveness of a critical economic sector, digital transformation can have negative consequences for jobs and inclusion.

Environmental: Digital strategies specific to promoting environmental sustainability include consideration of areas such as green energy and smart grids. Similar to the economic pillar, not having a digital strategy to enable a sustainable environment can have a negative environmental —as well as economic —consequences.

Enablers: Programmes, policies and initiatives must be in place to unlock the key resources necessary for digital transformation. They could include actions such as developing ICT infrastructure, clusters, start-ups programmes, cybersecurity and privacy policies, big data initiatives, a regulatory sandbox, e-payment systems, and B2B or B2G platforms. Mainly with crosscutting benefits to support the various strategies in the political, social, economic, and environmental pillars.

Good Practice Canvas brief

In this context, good practice is comprised of proven methods or techniques that have been generally accepted as superior to alternatives, that yield evidence-based impact and successful results, and that can be scaled-up and replicated.

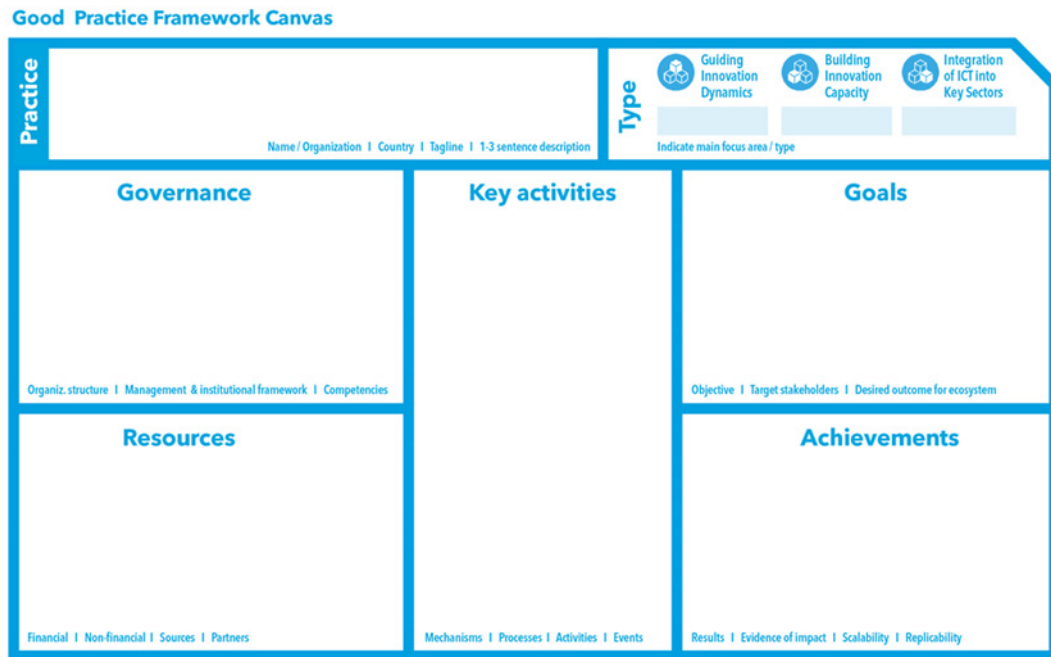
- develop flagship projects;
- comparatively assess the strengths and weaknesses of a practice;
- undertake evidence-based policy or programme development.

It is easy to add value to ecosystem initiatives using good practices. However, good practice should not be replicated “as is”, since every ecosystem — and every project— is different. For this reason, the good practice canvas is a framework for understanding the blueprint of any practice. These good practices can then be replicated in other ecosystem projects, where they can add value and increase their chances of succeeding.

Good practices are needed to help develop flagship projects, comparatively assess the strengths and weaknesses of one practice, and to undertake evidence-based policy or programme development.

This tool, composed of seven pillars, will help to extract the evidence-based blueprint of working practices (including key function breakdowns of these practices, along with their corresponding KPIs and success stories). As a result, a promising blueprint will enable stakeholders to choose the specific building blocks of good practice that they would like to adopt, replicate, and share.

Figure A3: Good Practice Framework Canvas



Source: ITU

Details of the seven pillars are provided below:

Practice: A short description of a way of doing something, the country or city where it is used, a tagline for a practice (if any) and a one- to three-sentence description (elevator pitch).

Type: This refers to the focus areas. These following three types are key to exploring and addressing opportunities for digital transformation.

- **Guiding innovation dynamics:** Is innovation on the map? How supportive of innovation is the general environment? A dynamic innovation environment demands regulatory organizational settings that are coherent, and which guide, facilitate and promote an innovation culture, mindset, projects and programmes.
- **Building innovation capacity:** Is there innovation infrastructure? Is that infrastructure sufficiently developed? Is it the right infrastructure to enable the ecosystem to grow sustainably? Does the infrastructure support, encourage, and inspire innovation?
- **Integration of ICT into key sectors:** Is innovation integrated across key sectors? An innovative entrepreneurial ICT start-up will realize its full potential only if it scales up well beyond its niche, enabling transformation in other industries.

Governance: Relevant information about organizational structure (e.g. flat or hierarchical), management (e.g. leadership structure and long-term driver or vision) and institutional frameworks (e.g. NGO or government agency), and the competencies (skills and functional roles) required to carry out the practice.

Resources: Refers to financial and non-financial resources such as human capital, equipment and processes. Additionally, an understanding of key partnership is also helpful, as many non-financial resources are derived from partnerships. Furthermore, knowing the funding sources of a specific practice is useful when replicating it, as this can help identify suitable stakeholder groups that can provide the required resources.

Key activities: Refers to events, related initiatives, processes and other activities, which can offer insights into the operating procedure(s).

Goals: The specific objectives a practice, target stakeholders and desired outcome for the ecosystem.

Achievements: Evaluate the practice on the following criteria:

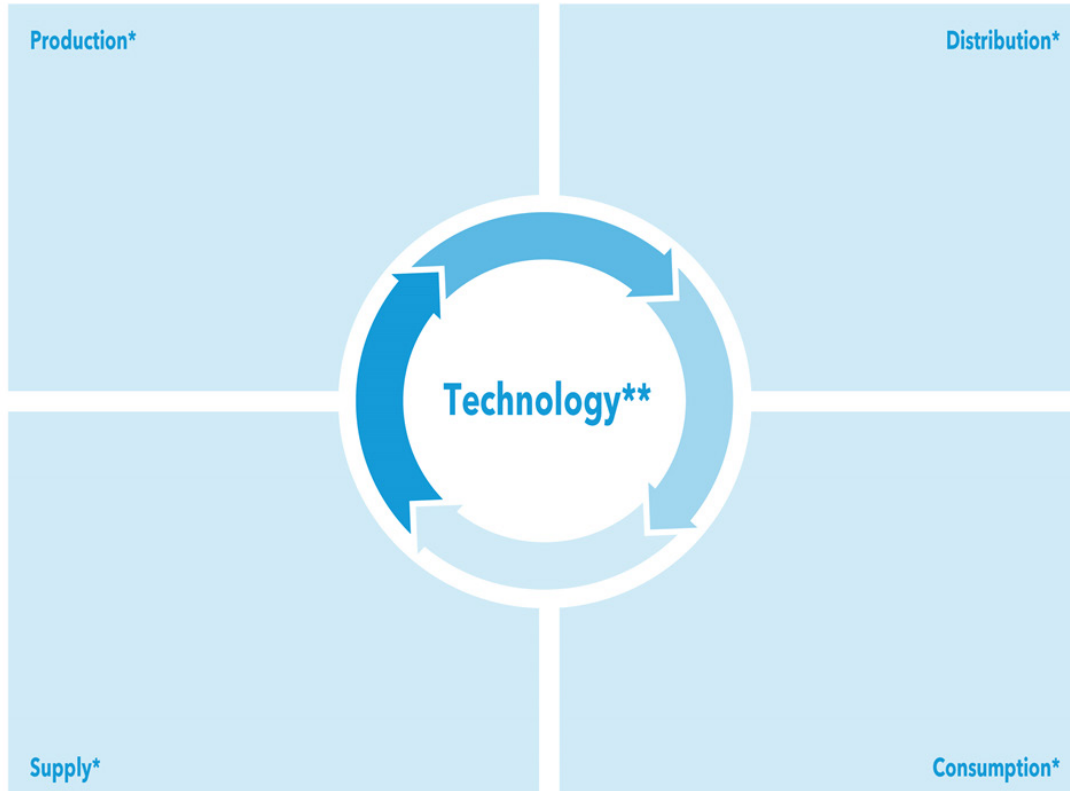
1. Replicability (refers to how easily it can be copied to a different context).
2. Scalability (the scope of the practice in achieving its goals).
3. Evidence of impact on the ecosystem (the effectiveness of the practice in achieving its goals).
4. Results (outcomes based on KPIs set by the practice).

Sector Design Canvas

The Sector Design Canvas is the primary tool with which to conduct a sector-specific assessment. It allows a more in-depth assessment of the specific challenges and opportunities posed by emerging technology in a chosen sector. This information can be used to ensure that key policies and initiatives are in place to develop flagship programmes that lead to accelerated sector development.

The recommended use for this tool is in focus group discussions. Alternatively, qualitative interviews or workshops are appropriate if stakeholders can be convened. The aim of a focus group discussion is to have as many stakeholders as possible to share their opinions, or their agreement or disagreement on the various questions in the pillars. The goal is to identify how innovators can accelerate the transformation of the value chain.

Figure A4: Sector Design Canvas



The Sector Design Canvas reflects the key information of each sector value chain in which technology can be leveraged to solve specific problems. The pillars are:

- **Supply:** Information about the suppliers in a specific sector value chain. This includes challenges and opportunities in digital transformation or use of technology to enhance business in the supply side of the value chain, specific technology platforms transforming the sector, collaboration and relationships with other stakeholders, policies for sector development and sector-specific digital strategies.
- **Production:** Information about the producers in a specific sector. Similar to information sought in the previous pillar.
- **Distribution:** Information about the distributors in a specific sector. Similar to information sought in the previous pillar.
- **Consumption:** Information about sector consumers. Similar to information sought in the previous pillar.
- **Technology:** Common understanding of how technological platforms or technologies are transforming the sector. Existing evidence, positive and negative, for this transformation; how stakeholders such as entrepreneurs, policy-makers, private sector, etc. are engaging to produce innovation for the sector.

Appendix B: Key terms and concepts

Accelerator: A start-up service working with a start-up or entrepreneur for a fixed period and providing intensive mentorship and development services.

Angel investment: Early stage investment intended to provide a boost to initially launch and develop a start-up. This funding is often provided by entrepreneurs, friends or families and connected with mentorship.

B2B Business-to-business: Services or products from private sector companies intended to be used by other private sector companies.

Cluster: A geographic concentration of interconnected businesses, suppliers and associated institutions in a particular field.

Collaborative regulation: Regulation created by collaboration among all the various government agencies involved in overseeing the digital economy.

Crowdfunding: Financing a new venture, product or project by collecting small amounts of money from large numbers of investors, often in exchange for perks such as early access to the product.

E-governance: The application of ICT to the delivery of government services, government communications and backend services and activities within the government.

Entrepreneurial support: Programmes such as incubators, accelerators, labs and other services that provide entrepreneurs with resources such as training, mentorship and business services.

Exit: A step in a business where the founder sells his or her investment in the company, often through sale or an IPO, limiting losses from a failing company or making profit from a successful one.

Financial technology (fintech): The application of ICTs to make financial services more efficient.

Foreign direct investment (FDI): Investment in the form of a controlling ownership stake in a business enterprise in one country by an entity based in another country.

Gross domestic product (GDP): The monetary value of all the finished goods and services produced within a country's borders in a specific time period.

Gross national income (GNI): The sum of value added by all producers who are residents, plus any product taxes not included in output, plus income received from abroad.

Hard infrastructure: Physical infrastructure to support businesses such as mobile and fixed connectivity, power, water, roads, physical plants, equipment and other elements.

Information and communication technology (ICT): An umbrella term covering wireless and wired communication, the hardware and software related to them and their applications.

ICT-centric innovation ecosystem: A description of an innovation ecosystem recognizing that ICTs are often at the centre of innovation and have a cross cutting role in many other sectors of the economy.

Information and communication technology for development (ICT4D): The use of ICTs for the purpose of economic and social development, humanitarian response or promotion of human rights.

Inclusive and sustainable industrial development (ISID): Development in which all parts of society benefit from industrial progress, which provides the means for tackling critical social and humanitarian needs.

Incubator: A start-up service providing business services and training, early stage support and mentorship and often office space and communities for start-ups and entrepreneurs.

Initial public offering (IPO): The first time that the stock of a private company is offered to the public. This often raises significant amounts of capital but shifts the company to a publicly traded firm.

Innovation: The implementation of a new or significantly improved product (good or service), process, marketing method or organizational method in business practices, workplace organization or external relations.

Innovation ecosystem: The major stakeholders and processes supporting innovation and the establishment of new businesses in a particular area, and their associations and connections.

Intellectual property/intellectual property rights (IP/IPR): The rights of persons over their creations. They usually give the creator an exclusive right over the use of the creation for a certain period of time.

Internet of things (IoT): The incorporation of sensors, connectivity, software, automation and other ICT solutions to allow objects to collect and exchange data.

Investment rounds: A series of investments made in a business intended to develop a business, each round focuses on a different stage of development, developing business models, expanding and scaling.

Massive open online course (MOOC): Training programmes offered to a wide community through online services.

Multinational corporation (MNC): A corporation that operates across national borders.

Open data sandbox: A collection of tools and resources, combined with a collection of open datasets intended to allow experimentation in finding uses for those datasets.

Peer-to-peer lending: The process by which individuals lend their own money to other individuals or businesses directly generally through a mediating entity.

Public-private partnership (PPP): A public sector project or business venture executed through a collaboration between a government entity and a private business.

Seed funding: Small amounts of investment, often in the form of grants or angel investment, used to initially launch or develop a company.

Small or medium enterprise (SME): A private firm that is beyond the start-up stage, but is still young, with limited staffing and/or income. The exact definition used in terms of upper and lower bounds on age and scale varies between institutions.

Smart cities: Urban development projects that incorporate ICT solutions into the provision of municipal services and the management of municipal assets.

Soft infrastructure: Programmes and resources in an innovation ecosystem that provide mentorship, skills, experience and other knowledge resources to support innovative businesses.

Soft skills: A series of skills such as communication, business management and administration, design, and other skills related to the running of a business, rather than the products or services that business provides.

Support skills: A series of skills such as accounting, legal advisory, regulatory compliance, and other skills necessary to meeting the requirements of running a business, often taken on by outside specialists.

Systems of innovation (SI): An understanding of innovation as a process representing the flow of information and collaboration between various actors.

Technical and vocational education and training (TVET): education, training and skills development relating to a wide range of occupational fields, production, services and livelihoods.

User-centred design: A design process focused on the experience of the end user, concentrating on empathy with users and use cases.

Valley of death: The period early in the development of a business where the amount invested in developing the business outweighs its current revenue. Businesses need continuous investment and other support and often fail during this time.

Valuation: The process of estimating the current worth of an asset or a company, or the result of such an estimation.

Venture capital: High-risk investment in an early stage business that has proven growth potential, intended to help the business develop and expand.

Appendix C: Selected images from workshops



Office of the Director
International Telecommunication Union (ITU)
Telecommunication Development Bureau (BDT)
Place des Nations
CH-1211 Geneva 20
Switzerland

Email: bdtdirector@itu.int
Tel.: +41 22 730 5035/5435
Fax: +41 22 730 5484

Digital Networks and Society (DNS)

Email: bdt-dns@itu.int
Tel.: +41 22 730 5421
Fax: +41 22 730 5484

Digital Knowledge Hub Department (DKH)

Email: bdt-dkh@itu.int
Tel.: +41 22 730 5900
Fax: +41 22 730 5484

Office of Deputy Director and Regional Presence
Field Operations Coordination Department (DDR)
Place des Nations
CH-1211 Geneva 20
Switzerland

Email: bdtdeputydir@itu.int
Tel.: +41 22 730 5131
Fax: +41 22 730 5484

Partnerships for Digital Development Department (PDD)

Email: bdt-pdd@itu.int
Tel.: +41 22 730 5447
Fax: +41 22 730 5484

Africa

Ethiopia

International Telecommunication Union (ITU) Regional Office
Gambia Road
Leghar Ethio Telecom Bldg. 3rd floor
P.O. Box 60 005
Addis Ababa
Ethiopia

Email: itu-ro-africa@itu.int
Tel.: +251 11 551 4977
Tel.: +251 11 551 4855
Tel.: +251 11 551 8328
Fax: +251 11 551 7299

Cameroon

Union internationale des télécommunications (UIT)
Bureau de zone
Immeuble CAMPOST, 3^e étage
Boulevard du 20 mai
Boîte postale 11017
Yaoundé
Cameroon

Email: itu-yaounde@itu.int
Tel.: + 237 22 22 9292
Tel.: + 237 22 22 9291
Fax: + 237 22 22 9297

Senegal

Union internationale des télécommunications (UIT)
Bureau de zone
8, Route des Almadies
Immeuble Rokhaya, 3^e étage
Boîte postale 29471
Dakar - Yoff
Senegal

Email: itu-dakar@itu.int
Tel.: +221 33 859 7010
Tel.: +221 33 859 7021
Fax: +221 33 868 6386

Zimbabwe

International Telecommunication Union (ITU) Area Office
TelOne Centre for Learning
Comer Samora Machel and Hampton Road
P.O. Box BE 792
Belvedere Harare
Zimbabwe

Email: itu-harare@itu.int
Tel.: +263 4 77 5939
Tel.: +263 4 77 5941
Fax: +263 4 77 1257

Americas

Brazil

União Internacional de Telecomunicações (UIT)
Escritório Regional
SAUS Quadra 6 Ed. Luis Eduardo
Magalhães,
Bloco "E", 10^o andar, Ala Sul
(Anatel)
CEP 70070-940 Brasília - DF
Brazil

Email: itubrasilia@itu.int
Tel.: +55 61 2312 2730-1
Tel.: +55 61 2312 2733-5
Fax: +55 61 2312 2738

Barbados

International Telecommunication Union (ITU) Area Office
United Nations House
Marine Gardens
Hastings, Christ Church
P.O. Box 1047
Bridgetown
Barbados

Email: itubridgetown@itu.int
Tel.: +1 246 431 0343
Fax: +1 246 437 7403

Chile

Unión Internacional de Telecomunicaciones (UIT)
Oficina de Representación de Área
Merced 753, Piso 4
Santiago de Chile
Chile

Email: itusantiago@itu.int
Tel.: +56 2 632 6134/6147
Fax: +56 2 632 6154

Honduras

Unión Internacional de Telecomunicaciones (UIT)
Oficina de Representación de Área
Colonia Altos de Miramontes
Calle principal, Edificio No. 1583
Frente a Santos y Cía
Apartado Postal 976
Tegucigalpa
Honduras

Email: itutegucigalpa@itu.int
Tel.: +504 2235 5470
Fax: +504 2235 5471

Arab States

Egypt

International Telecommunication Union (ITU) Regional Office
Smart Village, Building B 147,
3rd floor
Km 28 Cairo
Alexandria Desert Road
Giza Governorate
Cairo
Egypt

Email: itu-ro-arabstates@itu.int
Tel.: +202 3537 1777
Fax: +202 3537 1888

Asia-Pacific

Thailand

International Telecommunication Union (ITU) Regional Office
Thailand Post Training Center
5th floor
111 Chaengwattana Road
Laksi
Bangkok 10210
Thailand

Mailing address:
P.O. Box 178, Laksi Post Office
Laksi, Bangkok 10210, Thailand

Email: ituasiapacificregion@itu.int
Tel.: +66 2 575 0055
Fax: +66 2 575 3507

Indonesia

International Telecommunication Union (ITU) Area Office
Sapta Pesona Building
13th floor
Jl. Merdan Merdeka Barat No. 17
Jakarta 10110
Indonesia

Mailing address:
c/o UNDP – P.O. Box 2338
Jakarta 10110, Indonesia

Email: ituasiapacificregion@itu.int
Tel.: +62 21 381 3572
Tel.: +62 21 380 2322/2324
Fax: +62 21 389 5521

CIS

Russian Federation

International Telecommunication Union (ITU) Regional Office
4, Building 1
Sergiy Radonezhsky Str.
Moscow 105120
Russian Federation

Email: itumoscow@itu.int
Tel.: +7 495 926 6070

Europe

Switzerland

International Telecommunication Union (ITU) Office for Europe
Place des Nations
CH-1211 Geneva 20
Switzerland

Email: euregion@itu.int
Tel.: +41 22 730 5467
Fax: +41 22 730 5484

International Telecommunication Union
Telecommunication Development Bureau
Place des Nations
CH-1211 Geneva 20
Switzerland

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